BLUMEA

TIJDSCHRIFT VOOR DE SYSTEMATIEK EN DE GEOGRAFIE DER PLANTEN

(A JOURNAL OF PLANT-TAXONOMY AND PLANT-GEOGRAPHY)

UITGEGEVEN DOOR HET RIJKSHERBARIUM TE LEIDEN
(PUBLISHED BY THE RIJKSHERBARIUM, LEIDEN, HOLLAND)

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BLUMEA

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INHOUD — CONTENTS.

INDEX

to Vol. I

compiled by

J. J. SMITH

(Synonyms in italics)

BLUMEA

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VOORREDE.

„It is hoped that the actual value of this most important collection of historical material preserved in the Rijksherbarium is fully appreciated not only in Holland, but elsewhere, and that proper provision will be made for the amplification and study of these collections that in actual scientific value, with particular reference to Malaysia, are unparelled in any other single botanical institution of the world''.

(E. D. MERRILL in „Herdenkingsuitgave bij gelegenheid van de honderdjarige vestiging te Leiden [van het Rijksherbarium] — Med. van 's Rijks Herbarium No. 65, 1931, 3).

Vierentwintig jaren zijn verloopen sinds de instelling, die toen „'s Rijks Herbarium'' heette, begon met de uitgave van een reeks publicaties onder den titel van „Mededeelingen van 's Rijks Herbarium Leiden''. Juist 70 nummers zijn verschenen tusschen 1910 en 1933, met inbegrip van het laatstgenoemde jaar, de meeste daarvan onder het directoraat van Dr J. W. C. GOETHART. Het is hier zeker de plaats Dr GOETHART dank te brengen voor alles wat hij in die jaren voor deze uitgave van het Rijksherbarium heeft gedaan.

Nadat ondergeteekende op 2 October 1933 het directoraat van het Rijksherbarium uit de handen van den waarnemenden directeur, Dr W. A. GODDIJN, had overgenomen, kon een begin worden gemaakt met de uitvoering van enkele plannen, die in verband met zijn ervaring, in de tropen opgedaan, eenig perspectief voor de toekomst schenen te beloven. Zoo lag het, op grond van de zooeven genoemde ervaring voor de hand, dat de werkwijze van het Rijksherbarium zich meer in de richting van de Nederlandsch-Indische flora zou gaan bewegen, dan in de laatste decenniën mogelijk was geweest. Verwezenlijking van deze gedachte is mogelijk door samenwerking met het Herbarium en Museum van Systematische Botanie van 's Lands Plantentuin te Buitenzorg, waarmede ik reeds voor mijn vertrek uit Indië in dien geest overeenstemming mocht bereiken.

Een tweede punt van overweging was het vormen van een inniger contact met de Rijksuniversiteit te Leiden, met welks Herbarium het Rijksherbarium sinds 1832 verbonden is geweest. Dit contact was veelal van weinig beteekenis en de details van zijn toekomstige ontwikkeling

zullen nauwgezette zorg vereischen teneinde te vermijden, dat de archiefwaarde van het Rijksherbarium schade lijdt. Ik meen, dat het mogelijk is een inniger contact te bewerkstelligen zonder dat ten aanzien van het laatstgenoemde punt zoodanig risico wordt geloopen, dat het tegen de voordeelen niet ruimschoots zou opwegen; en niet alleen mogelijk, maar ook wenschelijk, want het kan tweeërlei belangen bevorderen: ten eerste kunnen de in het Rijksherbarium aanwezige schatten zoowel meer intensief als meer extensief tot hun recht worden gebracht, en ten tweede kan getracht worden het aantal medewerkers aan het gestelde doel niet onbelangrijk te vergrooten.

Bij het uitwerken van deze plannen kwam vanzelf een derde punt naar voren, zij het een punt van ondergeschikt belang. De „Mededeelingen van 's Rijks Herbarium" zijn een historisch gegroeide reeks publicaties, die, doordat zij van den aanvang af in vrijwel onveranderden vorm zijn verschenen, heden ten dage niet geheel modern meer zijn. Was er natuurlijk onder mijn voorganger geen directe aanleiding in die traditie eenige verandering te brengen, nu komt het mij voor, dat, zoo ooit, de verandering van directoraat en werkrichting ook het juiste oogenblik is, om de publicaties van het Rijksherbarium, waarvan de inhoud zich onder den invloed van de genoemde veranderingen allicht eenigszins zou wijzigen, ook naar den uiterlijken vorm te herscheppen.

Daarom werd behalve een handzamer formaat ook een modernere letter gekozen, terwijl de artikelen niet meer afzonderlijk zullen worden genummerd en gepagineerd. Het tijdschrift zal evenwel ook in zijn nieuwen vorm, evenals de „Mededeelingen" op ongeregelde tijden verschijnen. Dat ook de naam is veranderd, is natuurlijk een weinig belangrijke bijkomstigheid. Een van de belangrijkste overwegingen, dat daartoe gekozen is de naam BLUMEA (naar den eersten directeur van het Rijksherbarium, Prof. Dr C. L. BLUME [1]), directeur van 1829—1862) was de wensch, dat hij kort [2]) en karakteristiek zou zijn.

Het is mijn hartelijke wensch, dat „BLUMEA" zal uitgroeien tot een algemeen Nederlandsch tijdschrift voor plantensystematiek en plantengeografie. Bij den huidigen stand van de middelen van het Rijksherbarium echter is helaas voorshands eenige restrictie geboden. Tenzij meer middelen voor de uitgave worden gevonden, moet de voorrang worden verleend aan artikelen op plantensystematisch en plantengeografisch gebied, die

1) Het vignet is van de vaardige hand van Dr W. A. GODDIJN.

2) Cf. MERRILL E. D., One-name periodicals. — Brittonia 1, 1931, 1.

1. afkomstig zijn van: a. vaste, b. tijdelijke werkkrachten aan het Rijksherbarium;
2. zijn bewerkt op grond van of gedeeltelijk op grond van materaal, dat het eigendom is van het Rijksherbarium;
3. de flora (systematiek, floristiek) of de vegetatie (oecologie) van: a. den Indischen Archipel, b. de dien Archipel omgevende landen tot onderwerp hebben.

Zoolang deze restricties echter niet toegepast behoeven te worden, zal BLUMEA eveneens openstaan voor andere artikelen op haar gebied. De Directeur van het Rijksherbarium zal als verantwoordelijk redacteur gaarne met toekomstige inzenders in onderhandeling treden. Hij behoudt zich evenwel het recht voor artikelen te weigeren of aan inzenders bepaalde voorstellen tot inkrimping van een artikel of vermindering van het aantal illustraties te doen, wanneer de omstandigheden hem daartoe zouden nopen.

Het is mij een groot genoegen het eerste deel van „BLUMEA'' te kunnen openen met bijdragen niet alleen van alle leden van den wetenschappelijken staf, maar ook van zijn officieuzen medewerker Dr J. J. SMITH, vroeger Hoofd van het Herbarium te Buitenzorg, van Dr D. F. VAN SLOOTEN, tegenwoordig chef van die instelling, van mijn collega te Groningen, Prof. Dr B. H. DANSER, van mijn collega voor de algemeene plantkunde te Leiden, Prof. Dr L. G. M. BAAS BECKING en een zijner medewerksters, en ten slotte van den welbekenden bryoloog FR. VERDOORN. In bewerking is voorts een bijdrage van de hand van mijn ambtsvoorganger, Dr J. W. C. GOETHART, die voor dit nummer niet tijdig gereed kon zijn, en in een volgend nummer zal worden opgenomen. Ook zijn medewerking stel ik op hoogen prijs.

Moge „BLUMEA'' het zijne bijdragen tot de beoefening van die takken van de botanie, waartoe het Rijksherbarium zoo ruimschoots het materiaal bezit en moge, in het bijzonder, in overeenstemming met het hierboven gestelde motto, de intensievere bestudeering van de flora van Nederlandsch-Indië, door samenwerking van velen het binnen afzienbaren tijd mogelijk maken onze kennis te gieten in den overzichtelijken vorm eener flora; Nederlandsch-Indië is in dat opzicht bij welhaast alle buurkoloniën en zelfs bij de zusterkolonie Suriname, ten achter.

Leiden, Mei 1934. **H. J. LAM.**

EDITORIAL.

Twenty-four years have elapsed since the Institution, then called „'s Rijks Herbarium'', started a series of papers entitled „Mededeelingen van 's Rijks Herbarium, Leiden''. Exactly 70 numbers have been issued between 1910 and 1933 inclusive, most of them under the directorate of Dr J. W. C. GOETHART, to whom many thanks are due for his arduous work and his many cares in favour of these publications.

After the undersigned, on October 2nd, 1933, had taken over the directorate of the Rijksherbarium from the acting director, Dr W. A. GODDIJN, he could start realizing some projects which, in relation to his tropical experience, seemed more or less promising. First of all it was obvious that the Rijksherbarium should, to a greater degree than had been possible during the last decennia, contribute to the investigation of the flora of the Netherlands Indies. Effectuating this idea seems possible by a closer collaboration with the Herbarium of the Botanical Gardens of Buitenzorg, Java, with whose officers it was my privilege to come to an agreement before I left the colony. Another point to be considered was the establishment of a closer contact with the State University at Leiden, the herbarium of which has been united with the Rijksherbarium since 1832. This contact has been rather loose in various periods of the existence of the Rijksherbarium and in developing it, the details will have to be carefully studied and sounded, lest the archive value of the collection should be decreased. Without taking any risk as to this point, which cannot be fully compensated by the advantages, it is thought that a closer contact is both possible and desirable, as it may further two important interests: in the first place it is intended to exploit and to peruse both more intensively and more extensively the treasures of this Herbarium, and secondly an attempt will be made to increase the number of students in the field of investigation that is allotted to the institution.

During the preparations of these plans a third point has arisen of its own, demanding, though of little intrinsic importance, its individual solution. The „Mededeelingen van 's Rijks Herbarium'', being a historically grown series of publications, issued in practically the same form ever since the first number, can at present not be considered as a modern journal. As a matter of fact there was no particular reason why my predecessor should have made any alteration in the tradition.

However, it seems to me that, if ever, the time of changing the directorate and the way of working of the institution — which will probably also affect the contents of the journal —, must also be the right moment to reshape its exterior appearance. Therefore, next to a more standardized size, also a more modern letter type has been chosen; moreover, the various papers will no longer be separately numbered and paged. Also in its new form, however, the journal will be issued at irregular intervals. That its name has been changed too is, of course, a point of minor importance. One of the arguments that this name has been chosen to be „BLUMEA" (after the first director, Prof. Dr C. L. BLUME [1]), director from 1829—1862), was that it should be short [2]) and characteristic.

It is very much hoped that „BLUMEA" will develop into a general Dutch journal of plant taxonomy and plant geography. On account of the present state of the funds available to the Rijksherbarium, however, it is regretted that, for the time being, some restrictions are necessary. Unless more ample funds will be found for its publication, precedence must be given to those papers that

1. are written by a. permanent, b. temporary collaborators of the Rijksherbarium;
2. have made use of materials belonging, wholly or in part, to the Rijksherbarium;
3. are concerned with the flora (taxonomy, geography) or the vegetation (ecology) of a. the Malay Archipelago, b. countries surrounding that Archipelago.

As far as allowed by these restrictions, „BLUMEA" will gladly receive other papers of a similar nature. The director of the Rijksherbarium will be its responsible editor and will be glad to correspond with future contributors; however, he reserves to himself the right to refuse papers or to make such proposals concerning eventual alterations (e. g. as to the illustration or the extent of a paper) as may seem suitable or necessary in the circumstances.

I deem it a privilege to open the first number of „BLUMEA" with papers not only by all staff members of the Rijksherbarium, but by its unofficial collaborator Dr J. J. SMITH, formerly keeper of the

1) The vignette is by the able hand of Dr W. A. GODDIJN.

2) Cf. MERRILL E. D., One-name periodicals. — Brittonia 1, 1931, 1.

Buitenzorg Herbarium, by Dr D. F. VAN SLOOTEN, present keeper of that institution, by my colleague at Groningen, Prof. Dr B. H. DANSER and by my colleague for general botany at Leiden, Prof. Dr L. G. M. BAAS BECKING and one of his staff members, and finally by our well-known bryologist FR. VERDOORN. I am equally glad to announce a contribution by my predecessor Dr J. W. C. GOETHART, which could not be finished in time for the present issue but will appear in the next one; his collaboration to „Blumea'' is also very much appreciated.

May „Blumea'' do its part towards the development of those fields of botany, to which the Rijksherbarium may so amply yield the materials and many, more particularly, in accordance to the quotation which is heading the Dutch version of the present lines, the investigation of the flora of the Netherlands Indies, at no distant date make it possible to compile our knowledge into the comprehensive form of a flora. The Netherlands Indies has, in this respect, something to learn from almost all neighbouring colonies and even from its sister colony Surinam.

Leiden, May 1934. H. J. LAM.

ZUM GELEIT

von

D. F. VAN SLOOTEN,

Leiter des Herbariums des Botanischen Gartens zu Buitenzorg (Java).

Anlässlich der Centenarsfeier des „Rijksherbarium" zu Leiden im Jahre 1930 schrieb Prof. Dr L. DIELS in Berlin-Dahlem einen Beitrag, betitelt „Herbarien und Sammler", für die „Herdenkingsuitgave" der „Mededeelingen van 's Rijks Herbarium" (No. 62—69, Leiden, 1931). In diesem Beitrag wurde Wert und Bestimmung von Herbarien und die Aufgabe des Sammlers gekennzeichnet. Durch das Sammeln ganzer Pflanzen und genauer Etikettierung können, so führte DIELS aus, die Sammler viel beitragen zur Vermehrung der botanischen Kenntnis, u. a. von den Verbreitungsgebieten der Pflanzen und der Pflanzenökologie. DIELS kommt zu dem Schluss: „Selbst in den alten Kulturländern liegen dankbare Aufgaben in dieser Richtung vor. Doch am grössten ist die Verantwortung der Anstalten, die ihre Arbeit in erster Linie auf die tropischen Floren wenden. Denn das Gesamtbild, das wir uns von der Pflanzenwelt machen, gewinnt seinen Umfang, seine Mannigfaltigkeit und viele besondere Farben aus den Floren der Tropen. Mit der fortschreitenden Vernichtung der ursprünglichen Zustände in den wärmeren Ländern droht dieses Bild zu verarmen und eintöniger zu werden, ehe wir noch wirklich seinen Reichtum begriffen haben".

Java, das heutigentags grösstenteils Kulturland geworden ist, bestätigt die Wahrheit des zitierten Satzes überdeutlich. So sind, um ein spezielles Beispiel herauszugreifen, die Urwälder der Niederung, welche früher grosse Flächen bedeckten, bis auf kleine Resten *Opfer der Kultivierung* geworden, lange bevor man die ursprüngliche Vegetation in ihren Elementen gut kennen gelernt hatte. Möge die Entdeckung von Relikten heute auch interessant sein, vom pflanzengeographischen Standpunkt aus muss man sehr bedauern, dass die systematische Erforschung der Vegetation nicht vor der Vernichtung des Urzustandes zu gewisser Vollendung gebracht werden konnte.

Infolge dieser Tatsache ist dann auch die Kenntnis der Niederungswälder auf Java sehr beschränkt geblieben, und diese Lücke kann wohl

nicht mehr nachträglich ausgefüllt werden, wennauch Ausnahmen zu verzeichnen sind, wobei durch eine überraschende Feststellung ein Einblick gewonnen wird in ehemalige Verhältnisse. Ein Beispiel hierfür bietet die Auffindung eines kleinen Sumpfwaldes bei Tjitjadas, das nur 22.5 km in Luftlinie nordöstlich von Buitenzorg, ungefähr 100 m über See gelegen ist. Der Mitarbeiter des Herbariums in Buitenzorg Dr C. G. G. J. VAN STEENIS fand [1]), dass dieser Sumpfwald eine Flora aufweist, welche aus Elementen besteht, die wir sonst nur fast ausschliesslich aus dem grossen Danau-Moor in Bantam (West-Java) kennen. Dieses grosse Moor hat z. T. noch einen ursprünglichen Charakter mit manchen endemischen Bestandteilen [2]). Es gehört zu den Ausnahmen, da die meisten javanischen Moorgebiete schon Kulturbeeinflusst sind. Dieser Umstand ist mit Schuld an der beschränkten Kenntnis der ursprünglichen Sumpfwälder.

Ein zweites Beispiel beweist, dass für Java noch in zwölfter Stunde durch Sammler und Herbarium auch bezüglich der Flora *unangetasteter* Gebiete wissenschaftlich wertvolle Feststellungen gemacht werden können. Aus Anlass der Auffindung von *Primula imperialis*, die hier bisher nur von den Bergen Pangrango (West-Java) und Yang (Ost-Java) bekannt war, auf dem Papandajan (West-Java) auf einer Höhe von ca. 2300 m, hat VAN STEENIS die weiten Grasflächen dieses Berges einer genauen Durchforschung unterzogen [3]). Dabei hat er nicht weniger als 25 Pflanzenarten — darunter drei für die Bergflora Javas unbekannte — gefunden, die nach bisheriger Auffassung nur in Ost- und Mitten-Java vorkommen sollten. Dadurch haben die früheren hypothetischen Grenzen zwischen West- und Ost-Javanische Floren viel von ihrer Schärfe verloren.

Im starken Gegensatz zu Java sind die meisten anderen Inseln Niederländisch-Indiens noch viel ursprünglicherer Natur. Das gilt z. B. von Sumatra. Durch den Umstand, dass der „Prodomus Florae Sumatranae'' MIQUELS [4]) veraltet ist und trotz vieler Einzelpublikationen

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1) „Het moerasboschje bij Tjitjadas, Res. Batavia''. De Tropische Natuur XXIII [6], 1934.

2) Eine Uebersicht über den Charakter des Danau-Moores, das seit 1921 zum Naturmonument erklärt wurde, gab Dr F. H. ENDERT in „Tectona'' XXV, 1932.

3) „Eenige belangrijke plantengeographische vondsten op den Papandajan''. De Tropische Natuur XIX, 1930, p. 73—91; XXI, 1931, p. 101—108.

4) Flora Indiae Batavae. Supplementum I, 1860—61.

eine neuere übersichtliche Flora dieser botanisch so wichtigen Insel [1]) fehlt, wird es so sehr wünschenswert, dass wir mehr Zusammenfassendes erfahren, bevor die schon eingeleitete Kultivierung auch hier Zustände geschaffen hat, wie sie heute auf Java gegeben sind.

Unter den gegebenen Umständen ist es ausserordentlich begrüssenswert, dass der neue Leiter des „Rijksherbarium" zu Leiden auch dieses Institut tatkräftig in den Dienst der Erforschung von Indiens Flora stellen will. Ein Mittel hierzu wird die neue Zeitschrift für Systematik und Geographie der Pflanzen: „BLUMEA" sein, die heute in die wissenschaftliche Welt eintritt! Sie kann zu einer sehr wertvollen Ergänzung des „BULLETIN DU JARDIN BOTANIQUE DE BUITENZORG" werden.

Da eine zusammenfassende „Flora van Nederlandsch-Indië" sehr viel Arbeitszeit und Mittel erfordert und dies auch für die monographische Bearbeitung der Familien, worauf im Bulletin der Schwerpunkt gelegt wird, gilt, muss jede Mitarbeit in dieser Richtung begrüsst werden und dies umsomehr als die Schwierigkeiten, die solcher Arbeitsweise aus den gegenwärtigen Zeiten der Einschränkung erwachsen, am besten überwunden werden können durch harmonisches Zusammenwirken.

Unter diesen Gesichtspunkten ist es erfreulich, dass in einem neuen Organ, der „BLUMEA", die Mitarbeit eines weiteren Kreises erschlossen wird zur Erreichung ein- und desselben Forschungszieles.

Buitenzorg, am 8. Mai 1934.

1) MERRILL schätzt in „New Sumatran Plants" I (Papers of the Michigan Academy of Science, Arts and Letters XIX, published 1934, p. 149—203) die Anzahl der endemischen Arten auf 40—50 % der gesamt vorhandenen.

ON THE ECOLOGY OF A SPHAGNUM BOG

by

Members of the Leidsche Biologen Club

communicated by

L. G. M. BAAS BECKING and Miss E. NICOLAI.

(Leiden)

Statement of the problem.

For the ecologist systematic units are actors in a play. Whatever their christian- and family-names may be — it is their role, whether master or servant, whether villain or hero — which determines the character of the performance. This performance has, moreover, the property of being both continuous and simultaneous: all scenes are given at once. Such a continuous and simultaneous performance is called a *biocoenosis*.

In a great many ways, a biocoenosis reminds us of an organism. For the coördination between organs or tissues, or even cells is also continuous and simultaneous. A biocoenosis is a higher vital unit, and may be approached by the same methods which we use for the study of organisms (v. D. KLAAUW (24)). In the systematic approach we establish the name, sex and age of the actors, in the anatomical approach the "pattern" of the constitutional units is established ("the dramatical situation"), while the physiological approach is concerned with the metabolism of the entity ("the plot"). As counterpart of these methods. however, we have to consider the study of the environment. The environment, which LOTKA has called "the stage of the life drama" (28).

This environment may be analyzed, and its various factors recorded. A synthetic picture of the environment, the *milieu,* should be the common denominator of the potentialities of the organisms which constitute the biocoenosis.

Our colleague, Professor LAM, has emphazised, in his inaugural address (27) the fact that a taxonomical study "per se", without a stimulus from allied fields of science, such as Geology, Genetics and Ecology, may yield less satisfaction to the investigator than work

plotted in coordination with the related disciplines. This attitude encouraged us to report in this issue upon the results of an Excursion of the „LEYDEN BIOLOGISTS CLUB", held in the autumn of 1932 to a high-moor region in Drenthe.

Although none of the participants were ecologists and most of the results obtained were well-known in the literature, several of us have derived a stimulus from the field-observations which gave a fresh impetus for laboratory work. And regardless of the fact that men like GAMS (13, 14), HARNISCH (21), KOTILAINEN (25) and in our country W. BEIJERINCK (7) did give us synthetic pictures of the high-moor biocoenosis, the experience we obtained was our own, the methods of approach were, in part, different from the others and while we only spent a few days in the field, our group included several persons. As an instantaneous picture, therefore, our survey may have some significance.

In order to use the available time efficiently our study was centered upon a small highmoor pond, and after a preliminary topographical survey the character of its vegetation, of its water and of the climatological conditions was established.

The following members of the „LEIDSCHE BIOLOGEN CLUB" took part in the work: MISSES T. HOF, A. VAN OVEN, A. KRIJTHE, E. BEER, S. HASPERS, R. BOK and J. DE ZEEUW and Messrs. K. VAAS, H. VERDAM, CH. NASS and W. KARSTENS. Dr W. BEIJERINCK, Director of the Biological Station at Wijster, Drenthe, has given much help and advice. Without his collaboration the work would have been impossible.

D. F. 7, named in Dr W. BEIJERINCK's work (6), is an almost circular pond, situated in a slight depression in an open heather, halfway between Wijster and Spier. The diameter is 75—85 meters, the maximum depth is 2.2 meters, the area 0.6 Hectare (see Fig. 1). The heather slopes gently towards the N.W., and it seems that the bog drains in this direction. The Western part is covered by an almost closed cover of *Sphagnum medium* LIMPRICHT, in which there are many "kopjes" of *Calluna* and *Molinia*. The Eastern part is chiefly open water with islands of *Carex inflata* and *Calluna* + *Molinia*, partly with a sandy bottom.

The bog-ore stratum does not fully extend under the pond, the bottom sand, however, is almost stony-hard and seems quite impervious. The N.E. shore is steep and shows the effect of water erosion. The prevailing winds are S.W. As may be seen from the block-diagrams (Fig. 2),

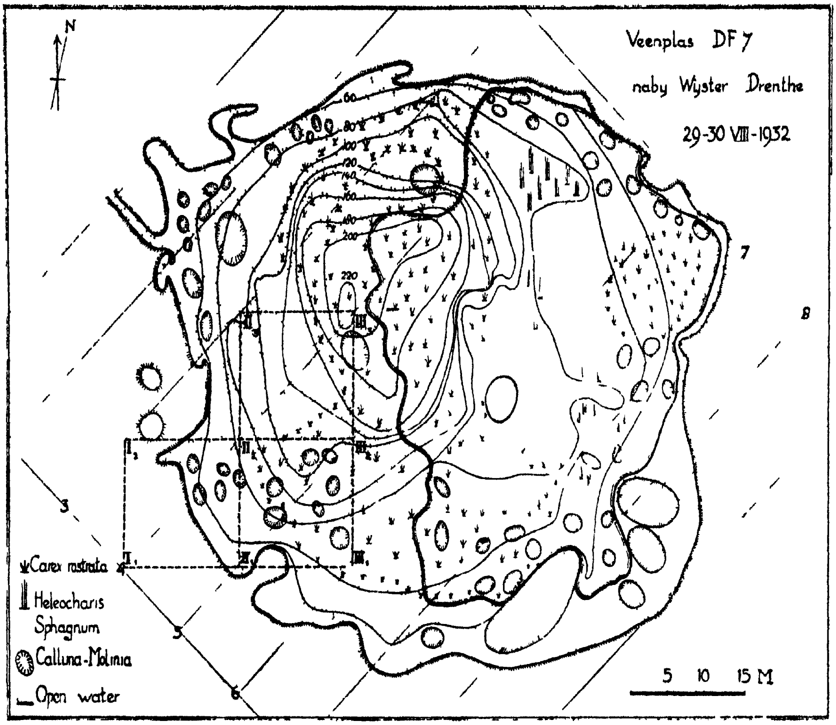


Figure I.
Map of D F. 7.

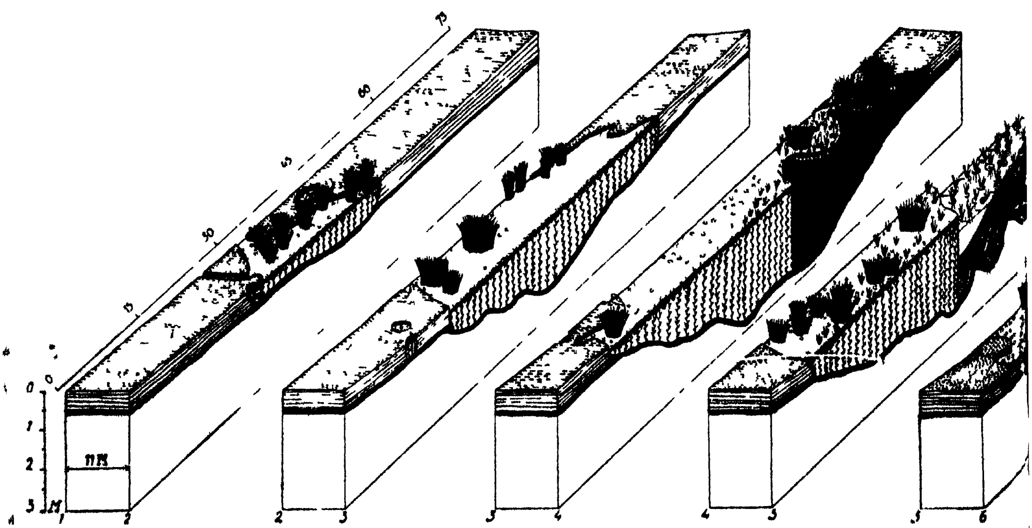


Figure
Block diagram
Legend as in

in which the bog is devided in to eight "Meter-blocks", running S.W. to N.E., the Sphagnum forms more than 2 M. deep masses. In the centre of the pool curious ripples exist on the bottom.

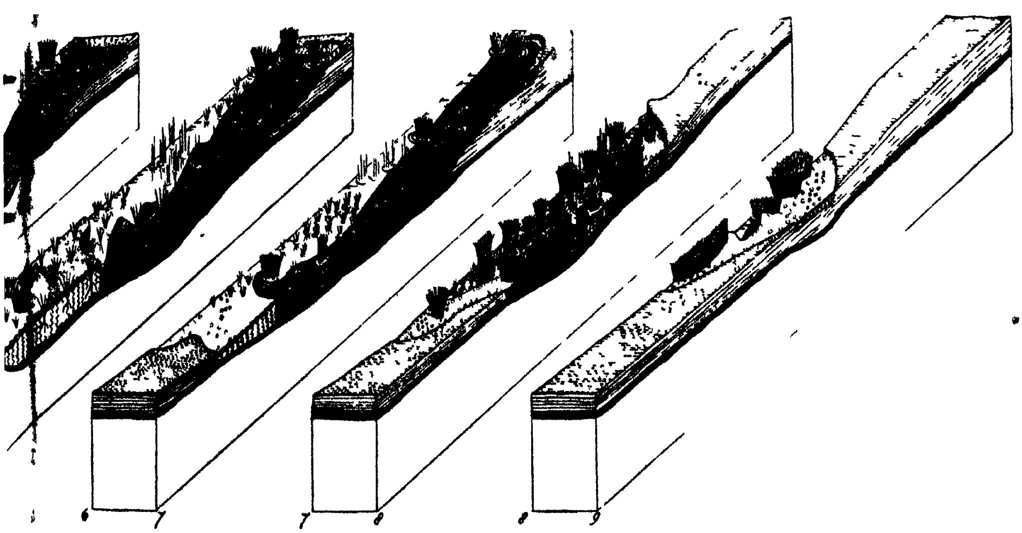
The character of the pond is that of an ombrogenic high-moor pond of the "Solle" type (according to the nomenclature of the German phytogeographers).

Methods of approach.

The pool does not represent a closed community. Possibly there are no exclusive biocoenoses on this earth because, even in the deepest mines, there is constant infection from the atmosfere, which carries a great amount of animated matter in the form of spores and cysts.* Motile organisms may also carry seeds and spores; birds, lizards and insects may cause a wide distribution of plants in the heather. The characteristic community will develop in spite of the "exposed" topography by the exclusiveness of its milieu, and therefore the factors of this milieu have to be analysed.

In ecological surveys much stress has been laid upon an accurate inventarisation of the existing organisms. While such a survey is, of

* The occurrence of the common Stickleback (*Gasterosteus aculeatus*) in D.P. 7 has remained a puzzle to us.



II.
D. F. 7.
Figure I.

course, very pertinent to a possible understanding of a vital community, it seems remarkable that the environmental factors (despite the perfection of the methods by which they may be determined) are, in many cases, neglected. By selecting a small area for our investigation the survey could be sufficiently restricted to allow for sufficient time to be devoted to environmental factors. Our survey was therefore specified as follows:

1. Topography.
2. Land animals (Investigated by Dr H. BLÖTE and a group of students. Miss A. M. BUITENDIJK (11) found two species of Collembola as new for the Dutch fauna: *Deuterosminthurus insignis* (Reut.) and *Deuterosminthurus novemlineatus* (Tullb.). Other results are as yet not available.
3. Aquatic animals (Investigated by Prof. Dr H. BOSCHMA and a group of students. Results as yet not available).
4. Higher plants.
5. Algae.
6. Microbes.
7. Mineral environment; dissolved substances and gases.
8. Acidity.
9. Temperature and humidity.
10. Pollen analysis of different strata.

In the short time available for our work no complete set of data may be expected. We have endeavoured to remedy some of these deficiencies by later excursions to Wijster and by laboratory work, the details of which will be reported upon in the following chapters.

4 The distribution of the higher plants.

A rough survey of this distribution is given on the map, Figure 1. The open water is almost free of vegetation at the N-E-end, except for the *Molinia-Calluna* "kopjes" and a few areae of *Heleocharis multicaulis* Sm. At the E-end a fairly large patch of *Carex inflata* Huds. (= *Carex rostrata*) occurs. This plant is also dominant in the central portion of the pond, in a zône running from S to N, interrupted only by occasional area's of *Sphagnum*. *Eriophorum angustifolium* Honckeny, and *Rhynchospora alba* Vahl are abundant over the entire W-area and also occur at the S-shore. The submerged moss-vegetation of the open water consists almost entirely of *Lophozia inflata* var. *laxa* and of *Sphagnum recurvum* P. d. B., as already mentioned by Dr W. BEIJERINCK

in his survey of 1926. It seems that the nature of the pond has not changed much in the last six years; possibly the pond has assumed a slightly less oligotrophic character, which also appears from the algal flora.

A more detailed survey was made of a few selected 30 ft traverses at the S-W end of the pond (see Fig. 3) where 4 × 30 square feet were

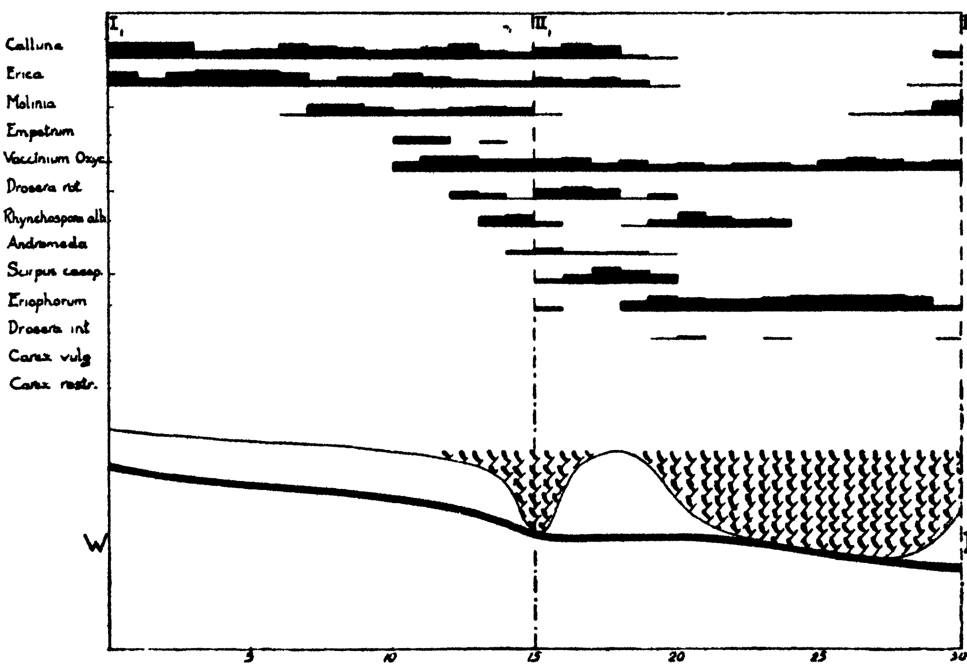


Figure III.

Frequence of different species on a traverse.
S—E at the S—W and of D. F. 7.
As shown in Figure I.

indexed on frequency ("Deckungsgrad", see e.g. MARKGRAF [29]) of the following species:

Calluna vulgaris Salisb., *Erica Tetralix* L., *Molinia coerulea* L., *Empetrum nigrum* L., *Vaccinium oxycoccum* L., *Drosera rotundifolia* L., *Rhynchospora alba* Vahl., *Andromeda polifolia* L., *Scirpus caespitosus* Hartm., *Eriophorum angustifolium* Honckeny, *Drosera intermedia* Dreves and Hayne, *Carex fusca* All., *Carex inflata* Huds.

The profiles I, II and III, show frequency and topography, *Calluno-Molinietum Sphagnetum* on the traverse with a "kopje" near II.

The appearance of the different components as a function of depth of the moor is striking. This also appears from the other W—E and the two S—N profiles (see Fig. 2).

Averaging the results of 120 square feet it appears that the various species may be classed as follows:

	Depth of bog (in cm.)		
	Minimum.	Average.	Maximum.
Calluna	0	15	20
Erica	0	30	60
Molinia	0	35	60
Empetrum	0	10	20
Carex fusca	0	20	20
Dros. rotund.	0	55	(0—>120)
Oxycoccus	2	70	(0—>120)
Trichophorum	3	20	(0—30)
Andromeda	5	20	(5—30)
Drosera intermedia	15	25	(10—30)
Eriophorum	15	40	(10—60)
Rhynchospora	25	40	(10—>100)
Carex inflata	30	—	>120

Much significance cannot be attached to these figures, however, as *Drosera intermedia* also occurs on sandy "transition" moor together with such forms as *Pedicularis*, *Lycopodium inundatum*, *Rhynchospora fusca* etc., in the *Rhynchospora alba* association. Forms like *Eriophorum angustifolium* also thrive on a solid soil. *Carex inflata* seems, in many cases, actually to reach the soil in very deep Sphagneta. Various *Carex* plants were dug up, and down to a depth of 120 cM., the roots seemed to reach the bottom. The same was the case with *Heleocharis* which, however, prefers open water and needs the contact for anchoring. In the case of the *Carex* it might be that the plants actually derived other benefit from the substratum (see also Pond [38]).

As the pH of the water in the entire "basin" amounted to 4 (see later) we might expect eury-oxyphilous to eury-mesoionic plants according to the Swedish classification (see Gams and Ruoff [17]). It seems, however, that the occurrence does not seem to fit in this scheme, according to which this plant should occur in environment with pH 5—6.5 (steno-meroionic). Gams himself points out this discrepancy in a later paper (Gams [16]). The great influence of pH upon the

distribution of plants cannot be denied (GUSTAFSON [20], ARRHENIUS [2]) but it seems that a rigid classification, based on pH *only*, may not account for the distribution of a group of plants which belong to the same biocoenosis. Root-structure, anaerobiosis, nature and depth of the substratum may all be factors that control a distribution.

According to Dr W. C. DE LEEUW there are indications that the following plant communities are present according to the system of BRAUN BLANQUET (10).

The boundary of the bog consists of an Ericetum tetralicis (1) followed by a Sphagnetum medii (2) and a Rhynchosporetum albae (3). Fragments of a Heleocharetum multicaulis (4) Caricetum inflato-vesicariae (5) and of a Caricetum fuscae (6) probably are also represented.

Plants (* are found in D. F. 7) indicating the first three associations (several of them being "characteristic species") are:

1. *Ericetum tetralicis.*

Erica tetralix *	Scirpus caespitosus *
Calluna vulgaris *	Carex panicea
Molinia coerulea *	Sphagnum compactum
Juncus squarrosus	(Cladonia rangiferina *)

2. *Sphagnetum medii.*

Vaccinium oxycoccus *	Sphagnum acutifolium
Andromeda polifolia *	„ molluscum *
Drosera rotundifolia *	„ recurvum *
Empetrum nigrum *	Aulacomnium palustre *
Eriophorum vaginatum *	Polytrichum commune
Sphagnum medium *	„ strictum
„ rubellum *	

3. *Rhynchosporetum albae.*

Rhynchospora alba *	Rhynchospora fusca
Drosera intermedia *	Zygogonium ericetorum
Eriophorum angustifolium *	Sphagnum recurvum *
Lycopodium inundatum	„ cuspidatum

The fragments 4), 5) and 6) all belong to a more eutrophic flora.

5. The Algae.

An unusual algal flora should be expected in the acid water of the high-moor bog DF 7.

BEIJERINCK (7) has investigated the flora and fauna of a great many peat bogs on the high-moor of Drenthe including DF 7. It seemed worth while to reexamine the flora for possible changes between the years 1927 and 1932.

The following samples were taken of the plankton of the peat bog on the afternoon of August, 30th;

three samples from the open water,

one of sqeezed-out *Sphagnum cuspidatum* growing in a depression near the Callunetum,

one of sqeezed-out *Sphagnum magellanicum* on a "kopje" near the Callunetum and one of sqeezed-out *Leucobryum* and *Sphagnum rubellum.*

The examination could not be undertaken on the spot, except for a few preliminary observations. Further examination was made on formalin-material by Mr. K. VAAS. Due to this fixation most of the Flagellates became irrecognizable.

In the following list of species those observed by BEIJERINCK (1927) are marked with B, those by VAAS (1932) by V.

TABLE I.

Algae of DF 7.

Flagellatae.		
Spongemonas. uvella	B	
Rhipidomonas Huxleyi	B	
Mallomonas caudata	B	
Synura uvella	B	V
Dinobryon divergens	B	V
Cryptomonas ovata	B	
Trachelomonas volvocina	B	
Goniostomum semen	B	
Glenodinium uliginosum	B	
Peridinium cinctum. var. palustre	B	V
„ inconspicuum	B	V
„ lubiniense	B	
„ minusculum	B	
„ pusillum	B	
Chlorophyceae.		
Asterococcus superbus	B	V
Oocystis solitaria	B	
Tetraedron enorme	B	

Binuclearia tatrana	B	
Microspora floccosa	B	
„ tumidula	B	V
„ spec. div.	B	V
Oedogonium Itzigsohni	B	V
„ spec. div.	B	V
Zygogonium ericetorum	B	
Mougeotia spec. div.	B	V
Spirotaenia fusiformis	B	
Cylindrocystis Brebissonii	B	
Penium spirostriolatum	B	V
Netrium digitus	B	V
Closterium acutum var. Linea	B	
„ Jenneri	B	
„ juncidum		V
„ Ulna	B	V
Tetmemorus Brebissonii v. minor.	B	V
Euastrum binale. div.	B	V
Micrasterias truncata	B	V
Cosmarium amoenum	B	
„ Cucurbita	B	V
„ Portianum	B	
„ pygmaeum	B	
„ pyramidatum	B	
„ subtumidum	B	V
„ trachypleurum minus	B	
Xanthidium antilopaeum	B	
Arthrodesmus incus	B	
„ octocornis	B	V
„ Brebissonii	B	
„ dejectum	B	V
Staurastrum furcatum	B	V
„ margaritateum	B	V
„ paradoxum	B	V
„ polymorphum	B	
„ teliferum	B	
Hyalotheca dissiliens		V
Gymnozyga moniliforme	B	V
Spondylosium pulchellum	B	V

Heterocontae.

Botryococcus Brownii	B	

Baccillariales.

Tabellaria flocculosa	B	
Eunotia Arcus	B	
„ gracilis	B	
Navicula Rhomboides	B	V
Pinnularia linearis	B	V
Nitzschia gracilis	B	

Cyanophyceae.

Chroococcus turgidus		V
Hapalosyphon hibernicus	B	V
Aphanizomenon flos aquae	B	V
Microchaete tenera	B	

A great many common filamentous algae (*Cladophora, Vaucheria Spirogyra*) do not occur in the water of the peat bog. The absence of those algae is due to the acid nature of the water and to its dearth in Calcium. Many of the blue-algae have a brownish colour, as already described by GEITLER (18) for similar localities.

The plankton of the open water contains the greater part of the filamentous algae, whereas the Desmidiacea and especially their smaller forms occur in the samples of sqeezed-out *Sphagnum.*

It stands to reason that the amount of species observed by VAAS is a great deal smaller than the list given by BEIJERINCK because of the limited material at our disposal. The more striking is the fact that VAAS has found a few species that did not occur in DF 7 in 1927, the year when it was examined by BEIJERINCK.

Under those forms we mention *Hyalotheca dissiliens* (Smith) Bréb., *Closterium juncidum* Ralfs, *Chroococcus turgidus* (Kütz) Näg.

The last form also occurs in a near-by pond, so that its area might very well have been extended in the last few years.

Hyalotheca dissiliens was also found by one of us on the reexamination of the natural environment in the autumn of 1932. On this occasion *Cosmarium sphagnicolum* and *Closterium linearis* were also added to the list. The algal flora seems to have increased in the last five years.

6. The Microbes.

The high actual acidity precluded the existance of many forms that ordinarily occur in natural waters. The investigations of VAN NIEL (32) for example, show that purple and green bacteria cannot thrive in acid waters; the same is true for *Cytophaga hutchinsonii,* which attacks cellulose, and of *Azotobacter chroococcum,* which form fixes atmospheric nitrogen and *Bacillus stutzeri,* a denitrifyer.

Other forms like *Aspergillus, Phycomyces* and the *Thiobacillus thiooxydans,* forms either adapted to a high acidity or ubiquitous organisms, might very well occur in the high-moor bogs.

Apart from such predictions, field observations already show evidence of well developed microbial life. The presence of methane and sulphuretted hydrogen for instance point to bacterial activity.

As far as the literature is concerned there are very few helpful statements as to the presence of specific organisms, apart from the work on humus-fungi carried out by OUDEMANS and his collaborators (33).

WAKSMAN (46) who has made an intensive survey of microbial activity in peat-bogs, seems to be chiefly interested in decomposition of plant-remains, both aerobically and anaerobically, and does not describe specific forms.

RITTER (39) mentions the occurrence of butyric acid fermentation in the bogs caused by typical *Clostridia.*

SCHLÖSSING (40) observed the disappearance of methane when the cultures were infected with heather-soil.

Evidence of bacterial activity as shown by the presence of volatile acids will be discussed later in this paper.

Dr W. BEIJERINCK demonstrated the presence of bacteria in the air-cells of *Sphagnum cymbifolium* and Miss A. VAN OVEN corroborated this fact. It seems, therefore, that a copious bacterial flora exists in peat-bogs and a more detailed investigation was desirable. This investigation has to be considered, however, as a preliminary survey.

Samples of bog-water were collected in evacuated soft-glass tubes drawn out to a fine point, which point was heated in a flame before immersion. After immersion the point was broken off and the filled tube sealed with Sphagnum as the "Primus-burner" did not give sufficient heat to seal the tube.

Mud from the bottom of the peat-bog and different species of Sphagnum were collected in sterilized bottles.

A direct survey of the microbes was only possible in the above mentioned case of Sphagnum-plants.

For further investigation of the bacterial flora, carried out by Miss A. VAN OVEN, the samples were inoculated in various culture-fluids.

Those fluids were intended to give the optimum conditions for the growth of different species of bacteria, in order to obtain an accumulation of these special bacteria.

Two series of each culture-fluid were examined, one having the original composition as cited in the literature, the other similar to the former but adjusted to a pH of 4.

The following species of bacteria could be obtained:

a. *denitrifying bacteria,* isolated in a medium used by ELEMA (13) containing 2 % glycerol and 0.5 % KNO_3, buffered to pH 4 by means of citric acid. Under anaerobic conditions development of gas could be observed within a week.

Gas- and bacterial development proved to be more copious in the cultures adjusted to pH 4.

The gas proved to be a mixture of carbon dioxyde, oxygen and nitrogen. A pure-culture on peptone-agar showed white colonies of rod-shaped Gram-negative bacteria, 1—4 μ in length.

b. *aerobic thiobacteria,* cultivated in a solution indicated by KÜSTER (26) containing $Na_2S_2O_3$, $NaHCO_3$, NH_4Cl and $MgCl_2$; one series buffered to pH 4, the other by means of K_2HPO_4 to pH 5.4.

The aerobic cultures showed a marked development of bacteria indicated by the production of sulphur.

In this case too the culture-fluid adjusted to pH 4 showed a more copious development of the microbes.

Pure-cultures on peptone-agar and microscopical investigation showed no difference whatever between those forms and the denitrifying bacteria. It seemed justified to try the aerobic Thiobacteria on denitrifying power in anaerobic cultures and vice-versa.

Those cultures succeeded, so probably both processes are due to the action of one and the same organism.

A further investigation on this subject was carried out by Miss T. HOF in the Microbiological Laboratory at Delft. *

Miss HOF inoculated the Thiobacteria from a pure culture on

* The Director of this Institute, Prof. Dr A. KLUYVER, has given us much helpful assistance.

peptone-agar in a medium described by BEIJERINCK (5) containing $Na_2S_2O_3$, $NaHCO_3$, NH_4Cl, $MgCl_2$ and KH_2PO_4 instead of K_2HPO_4; adjusted to a pH of 4 by means of phosforic acid. The decomposition of thiosulphate was controlled by titration with iodine; after six days a disappearance of thiosulphate could be observed; the pH increased from 4 to 8. In the fluid neither sulphate nor sulphur were formed.

Very likely the following reaction takes place:

$$2\,Na_2S_2O_3 + O + H_2O = Na_2S_4O_6 + 2\,NaOH$$

In this case the increasing pH is due to the formation of NaOH.

The various reactions obtained with the Thiobacillus of Wijster showed a marked resemblance with forms described by TRAUTWEIN (46).

Therefore the bacteria were cultured in the medium as given by TRAUTWEIN ($Na_2S_2O_3$, $NaHCO_3$, NH_4Cl, $MgCl_2$, K_2HPO_4) but adjusted to a lower pH by replacing K_2HPO_4 by KH_2PO_4 and by addition of phosforic acid.

In the fluid adjusted to pH 4 no growth of bacteria took place; in a fluid of pH 5.5 the bacteria developed well as was shown by the fact that within two weeks the whole amount of thiosulphate had disappeared and the pH increased from 5.5 to 8.

The only difference with TRAUTWEIN's Thiobacillus seems to be that the latter causes the formation of tetrathionate and of sulphate, whereas the Thiobacillus of Wijster does not produce sulphate in the fluid.

The production of polythionates could be proved by addition of bromine to the culture-fluid which caused the formation of sulphate.

TRAUTWEIN's Thiobacillus causes denitrification both under autotrophic and under heterotrophic conditions (47), whereas Miss HOF tried in vain to obtain denitrification with the Thiobacillus of Wijster.

Considering the fact that Miss VAN OVEN obtained denitrification with the same bacteria in the same media, the different observation might be explained by a loss of the faculty of denitrification caused by prolonged culture on peptone-agar. BEIJERINCK (6) described a similar case: bacteria which caused denitrification with Sulphur as a source of energy lost this faculty after culture on organic media.

In this case no further observations have been made and the question remains open whether the Thiobacillus of Wijster is able to cause denitrification.

In any case the form seems to be related to TRAUTWEIN's Thiobacillus (46).

c. *Sulphate-reducing bacteria* developed only in the cultures inoculated with bottom-mud from the bog. After two weeks the culture-fluid of BAARS (3) became black by the formation of PbS.

The cultures inoculated by samples of bog water showed no such development of bacteria whereas in a few cases the inoculation with Sphagnum plants gave a development of bacteria after 4 weeks.

The bacteria observed were Spirillae and rod-shaped bacteria; pure cultures did not succeed.

d. *Butyric-acid bacteria* developed abundantly from mud, water and Sphagnum-inoculations under anaerobic conditions; the media contained glucose and fibrin or soluble starch and fibrin.

Microscopical examination showed plectridia about 4 μ in length.

In the solutions buffered to pH 4.3 the bacteria caused a slight increase of the pH to about 4.5; in cultures with an initial pH of 7 a decrease occurred down to pH 4.5.

The butyric-acid bacteria seem to form an important part of the microbiological flora of the peat-bog, as was observed already by RITTER (39).

As to the occurrence of cellulose-decomposing bacteria no definite observations have been made. Only in one case a slight decomposition of cellulose could be observed. In this case 1 gram of straw and 5 cc. of a sample (mud or water) were added to a solution according to WAKSMAN (50), containing $(NH_4)_2PO_4$, $MgSO_4$, KCl and K_2HPO_4. Cultures both under aerobic and anaerobic conditions showed a beginning of decomposition after three months. Small rod-shaped bacteria were present.

Examination of the water and mud of the peat-bog on the presence of Fungi was carried out by inoculation on prune-agar buffered to pH 4. A Fungus developed and could be classified by the Central Bureau of Fungus Cultures at Baarn as *Syncephalastrum cinereum* Bainier.

7. The environment.

Mineral environment and gases.

One of the most striking characteristics of high-moor bogs is the oligotrophic character, the dearth in mineral substances. The following analysis of the water of DF 6, a peat-bog near to DF 7, carried out by the Central Bureau of Hygiene in the spring of 1926 is a sufficient proof of this fact.

TABLE II.

Free carbon dioxide	6.1	mgr/litre
Fe_2O_3	0.1	„
CaO	3.3	„
MgO	3.0	„
P_2O_5	0	„
K_2O	0	„
Cl^-	12	„
Total amount of nitrogen	1.6	„
Oxygen consuming capacity	7.4	„
Free oxygen	10.5	„
Temperature during the determination of the oxygen ...	14.5° C.	

DF 7 belongs to the typical high-moor bogs which probably do not communicate with the ground-water, therefore its mineral composition depends entirely on the rain-fall. In relation to this fact it seemed interesting to obtain an analysis of the rainwater. This analysis was made by the "Government Bureau of Water Supply" (Rijksbureau voor Drinkwatervoorziening) of a sample taken in the spring of 1933.

TABLE III.

Conductivity at 18° C. $\times 10^6$	29	
Cl^-	4.9	mgr/litre
NO_2^-	0	„
NO_3^-	0	„
SO_4^{--}	7.5	„
Ca	3.3	„
Ca as CaO	4.6	„
Mg	0.7	„
MgO	1.2	„
Na	4.9	„
Total hardness	0.63	

During the excursion the chemical survey of the bog-water was limited to the analyses of oxygen, carbon-dioxide and sulphuretted hydrogen.

The presence of volatile organic acids was examined in the laboratory at Leyden.

The amount of dissolved oxygen was determined by the original method of WINKLER (54), the samples have to be collected with great

care in order to avoid the entrance of air-bubbles into the bottle. Therefore the sample bottle was connected with an aspirator; by applying suction to the outlet of this aspirator the water was flushed through the sample bottle into the aspirator.

To the samples were added successively manganous sulphate, alkaline potassium iodide solution and sulphuric acid. The iodine set free is a measure for the amount of dissolved oxygen and may be titrated easily with a solution of sodium thiosulphate.

The results were expressed in percentage of saturation by using a graph in which the correlation between oxygen in mgr/litre and temperature of the sample is given.

It was dubious whether this method could give the exact amount of oxygen in the sample because of the presence of organic matter in the water; and above all the relatively large amount of sulphuretted hydrogen appeared as a source of errors.

In order to avoid those errors the samples were treated at first with concentrated sulphuric acid and a potassium permanganate solution, as indicated in the "Standard methods for the Examination of Water and Sewage" (45).

As the last method gave very uncertain results and as many objections were made to it (ALSTERBERG [1]), the results obtained by the original WINKLER method seemed preferable with the restriction that the results should be a little too high.

In the literature the dearth of oxygen is considered as one of the characteristics of the peat-bogs (PEUS [37]). HARNISCH (21) observes that in small bogs when the water is not disturbed a total lack of oxygen occurs, whereas in larger bogs the surface is stirred by the wind and may contain a considerable amount of oxygen. For our small pond one could expect a low saturation value. This prediction proved to be true. Two samples were collected at two localities; in the open water and in a depression of the Sphagnetum where the greatest changes were bound to occur in connection with photosynthesis; at the same time water from the surface and from a deeper layer (10—20 cm below the surface) was sampled.

The percentage of saturation was small, the highest amount in the Sphagnetum being 20 %, in the open water 93 %. A rapid decrease was observed in the deeper layers.

Figure 4 shows the variation in oxygen-saturation of a depression in the Sphagnetum during a day and a night, the samples being taken at 1 cm. and at 10 cm. below the surface.

It may be seen that the amounts of oxygen increase in the surface water during the morning and that a maximum occurs between 13 and 15 hours, followed by a rapid decrease and a minimum at midnight.

The difference between surface and deeper layers needs no further explanation.

It proved to be interesting to compare those results with the data obtained for the amount of sulphuretted hydrogen (as shown in the same Figure). Sulphuretted hydrogen was determined by adding to the

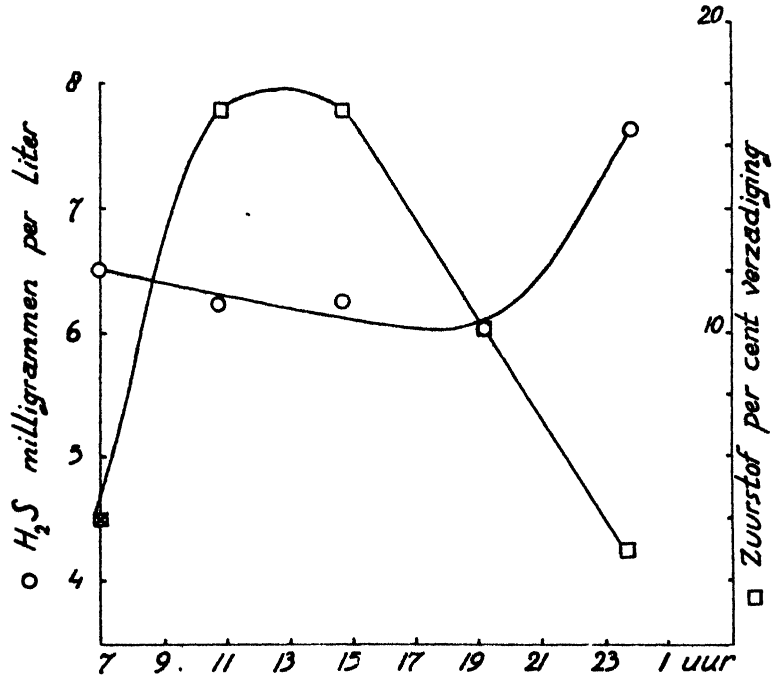


Figure IV.

H_2S and oxygen-content of the water during the day.

samples a known amount of standardized iodine solution and by titration of the excess of iodine with sodium thiosulphate. In August the amount of H_2S varied from 4.3—7.82 mg/L. As the samples for this examination were collected together with the samples for the oxygen determination the results could well be compared and the figure shows a minimum of H_2S when the amount of oxygen has reached its maximum whereas with decreasing amount of oxygen the H_2S increases and reaches its maximum after midnight.

So there was observed a striking correlation between the amounts of these two dissolved gases.

The third gas dissolved which was subject to our investigations was the carbon dioxide.

Carbon dioxide may be present in natural waters in three forms: free carbon dioxide or carbonic acid, bicarbonate and carbonate.

As the pH of the water of DF 7 proved to be 4, at this acidity the carbon dioxide occurs only in its free form; the amount of carbonate and of bicarbonate is so small as to be negligible.

This may be easily derived as follows:

$$k_1 [H_2CO_3] = [H^+] . [HCO_3^-] \qquad (1)$$

$$k_1, \text{ the dissociation constant} = 3.5 \times 10^{-7}$$

The bicarbonate dissociates to carbonate:

$$k_2 [HCO_3] = [H^+] . [CO_3^=]$$

$$k_2 = 4.7 \times 10^{-11}$$

As the concentration of hydrogen ions occurs in those equations, the influence of the pH on the ratio of the three forms of carbon dioxide will be of great importance.

When we take the total amount of carbon dioxide as 100, a third equation is:

$$[H_2CO_3] + [HCO_3^-] + [CO_3^=] = 100,$$

and combination with the other equations yields:

$$H_2CO_3 = \frac{100}{1 + \frac{k_1}{[H^+]} + \frac{k_1 k_2}{[H^+]^2}}$$

In the water of DF 7 the pH is 4, so for the concentration of the hydrogen-ions we substitute $[H^+] = 10^{-4}$, which gives an amount of H_2CO_3 of 99.99 %.

It is quite clear that the amount of bicarbonate may be neglected.

The method given in the literature for the determination of free carbon dioxide is by titration with a solution of 1/44 N. sodium carbonate with phenol-phtalein as an indicator.

Considering the high acidity of the water of the peat bog it is improbable that this low pH is due only to the presence of carbon dioxide (see below).

With a solution of sodium carbonate we do not only determine the amounts of carbon dioxide but the sum of all acids present in the water. In conseqtence the results obtained by means of this method for the amount of carbon dioxide must be too high.

We tried to apply another method for the determination of the carbon dioxide. At first this method seemed unpracticable for field work but after some improvement it gave reliable results.

The principle is to lead an air-current, free from carbon dioxide, through the boiling water-sample into an Erlenmeyer-flask filled with barium hydroxide solution; the main current was divided into two smaller ones, one of which reached a flask with Ba-hydroxide directly, the other after passing through the boiling water sample.

Both Erlenmeyer-flasks contained the same amount of barium hydroxide and by titration with a standard solution of hydrochloric acid, the difference of the acid required gave a measure for the amount of carbon dioxide.

HÖLL (22) has investigated a great many peat bogs on their chemical composition; his data for carbon dioxide amount to 25 mg./L.; HÖLL states that in winter an amount of 30 mg./L. may be expected. HÖLL's data are obtained by titration with sodium carbonate.

Bij means of the new method the highest amount observed in DF 7 was 7 mg./L.

In the month of October the following data were observed:

TABLE IV.

Locality	Temperature of water	pH	mg./L. CO_2 new method	mg./L. CO_2 titration method.
Sphagnetum DF 7	9.6	4.0	6.7	15.0
Open water DF 7	9.6	4.1	6.4	7.6
,, ,, ,, ...	7.8	4.0	5.76	9.75

In view of the data obtained we suspect that the data given in the literature for the amount of carbon dioxide in acid waters are probably too high. This is due to the method used and therefore a new method (in this case titration with barium hydroxide) should be preferred.

Quantitative changes in the three gases may be due to biological processes.

8. The acidity.

We had occasion to mention several times the high acidity of the high-moor peat bogs. To this acidity the peat owes its preserving qualities, as a great many bacterial processes are excluded in this range of pH.

Before discussing the possible causes of the low pH we will mention the observations made on the water of DF 7.

Determination of pH was carried out by means of the colorimetric method. To the buffers (Sörensen and Clark) were added indicators suited to the special range; addition of the same indicator (Brom-cresole-green or Brom-thymol-blue) to samples of the bog water and comparison of the coloured buffers allowed us to determine the pH of the water with an accuracy of 0.1.

The values of the pH were situated in the range from 3.7—4.1, the highest, 4.1, being observed in the open water of the bog directly after a rain storm; before the storm the pH was 4. This sudden increase of the pH demonstrates the fact that the bog water has no buffer-capacity.

The values for pH below 4 were observed in the Sphagnetum.

Observations during 24 hours showed no changes in the values for the pH except in one case, when the water of the Sphagnetum had a pH of 3.8 in day-time; the same night the pH had increased to 3.9.

A low pH could be expected from the literature. Several causes may contribute to explain this high acidity, the most plausible of which will be discussed here:

1. In the first place the amount of carbon dioxide is often considered as the important causal agens (Höll [22]).

This author apparently overestimated the capacity of this factor as shown by the following observations:

a. the bog water was boiled thoroughly in a hard-glass test tube; the increase of the pH did not exceed 0.2; in many cases no increase at all could be observed.

As we may expect that the whole amount of carbon dioxide is driven out by boiling the water, the gas does not seem to have much influence on the acidity of the water.

b. Due to photosynthesis the Sphagnetum should show considerable difference in pH during the day and night, if the acidity were chiefly caused by the carbon dioxide.

No such changes were observed by us, in accordance with MUENSTER-STRØM (31) who found that in the high-moor waters in Norway, where great quantities of green algae were actively assimilating, no increase in the pH could be observed.

c. The pH caused by a certain amount of carbon dioxide may be calculated very easily. According to JOHNSTON (23) carbonic acid, excess base $[B^+]$ and hydrogen-ion-concentration $[H^+]$, are related as follows:

$$[H_2CO_3] = \frac{\{[B^+] + [H^+]\}[H^+]^2 - k_w[H^+]}{k_1[H^+] + 2\,k_1k_2}$$

(k_w being the dissociation-product of water).

In case of the bog water $[B^+] = 0$ and substitution of H_2CO_3 yields $[H^+]$ and, accordingly, pH.

Substituting the maximal amount observed in DF 7 (6.7 mg./L.) a pH of 5.3 should be the result, whereas the maximal amount given by HÖLL (30 mg./L. CO_2) yields a pH of 4.8.

In both cases the pH is far too high, considering the actual value of about 4.0.

The conclusion seems, therefore, warranted that in the insufficiently buffered milieu the carbon dioxide will cause a certain decrease of the pH, but in no case the low pH should be attributed exclusively (or even for an important part) to the presence of carbon dioxide.

2. The same consideration holds for the influence of sulphuretted hydrogen upon the pH; the amounts present in the bog water may only cause a change in the second decimal place of the pH.

3. Nor can much value be attached to the opinion of SKADOVSKY (42) that ferro- and aluminum salts cause a pH < 4 in Russian high-moor bogs. As the analysis of the water of DF 6 gives an amount of ferro-ions less than 0.1 mg./L. no such influence may be expected.

4. The presence of small amounts of organic acids in the water of bogs seems a well established fact.

As the results of the microbiological survey showed the presence of butyric-acid bacteria, it is quite probable that butyric acid and other organic acids are present in the water.

The method of DUCLAUX (12) was used in the laboratory to investigate the presence and quantity of volatile organic acids. By distillation and fractional titration of the distillate the presence of

small and varying quantities of butyric or valeric acids could be demonstrated.

Those acids also contribute to a decrease of the pH but neither of the above mentioned acids may be considered as the main factor in the problem of the acidity, as the amounts were much too small.

Three more important theories remain to be discussed:

5. ODÉN (34, 35) and his school attribute the acidity of bog water to the influence of humic acids,

6. PAUL (36) to an active secretion of an unknown acid by the cell walls of the Sphagnum,

7. BAUMANN and GULLY (4) have propagated the idea that humus and the cell walls of Sphagnum are able to exchange ions with the environment so that hydrogen-ions are set free by absorption of the kation.

This latter theory, which preceded that of ODÉN, has met with much opposition, but the observations made on the mineral environment of the peat bog have impressed us with its plausibility so that we prefer it to both PAUL's or ODÉN's speculations.

The observations on the humic acids carried out by ODÉN and his collaborators lead to a division of the humic acids in three groups; one of them, the "fulvic-acid" group, constitutes the soluble substance, and, according to ODÉN, the cause of the brownish-yellow colour of the water in peat bogs is due to fulvic acids. No further observations have been made about the composition and chemical properties of the fulvic acids.

The water of DF 7 had a yellow colour, but could be made colourless by filtration through a Seitz filter; as the pH did not change after the filtration there seems to be no correlation between the yellow colour (eventually caused by fulvic acids) and the pH.

The other humic acids are considered by ODÉN as to be tetrabasic acids. By measurement of the conductivity ODÉN concludes that they are able to cause a low pH when dissolved.

WEHRLE (53) attributes a great importance to the presence of humic acids in the bog waters of high-moors, but HÖLL has opposed this statement of WEHRLE by referring to a great many peat bogs with a low pH and apparently, without humic acids.

Considering those observations and the uncertainty of the composition of those acids, the chief cause of the high acidity cannot be attributed to a direct influence of those acids. Their possible in-

direct influence will be treated under the discussion of the theory of ionic exchange.

PAUL's observations on the "Kalkfeindlichkeit" of Sphagnum have lead him to believe that the Sphagnum plants secrete an acid; in an alkaline milieu the acid is immediately neutralized and the plant proceeds to produce more acid, by which overproduction it exhausts itself. The concentration of the alkali has no importance but the total amount seems to dictate the process.

The observations of PAUL have stimulated many investigators to study the problem. By their results it is shown that the different species of Sphagnum show a different reaction on the substrate and on the pH of the environment.

The main interest of the later literature on this subject seems to be in the direction of the influence of the substrate on the Sphagnum plant, whereas the influence of Sphagnum on the environment has been neglected.

BAUMANN and GULLY consider the cell-wall to be a colloid which, when placed in a salt-solution, absorbs the kations exclusively and sets free the acid.

Much opposition to the theory of BAUMANN and GULLY, headed by ODÉN and his school, resulted in the abandonment of the exchange-theory during many years, until FREUNDLICH (15) pointed out its importance for colloid chemistry. Zeoliths and aluminum silicates brought in contact with neutral salts cause a decrease in the pH of the salt solution and FREUNDLICH claims a similar behaviour for the cell walls of Sphagnum, based upon the observations of BAUMANN and GULLY.

This so-called "Neutralsalzzersetzung" has since long been subject of many investigations in Soil Science. The experimental fact on which it was originally based is: that an extract of humus-soil in a neutral salt solution (as for instance potassium chloride) shows a higher acidity than an extract of the same soil in pure water.

TRÉNEL and HARADA (48) have given a discussion of the current literature on this subject.

As to the influence of the Sphagnum plants on the acidity of the substrate we mention the observations of SKENE (43) who obtained a marked decrease of the pH by growing Sphagnum in a solution of sodium chloride.

Further observations were made by STELMACH (44) on the conduct of *Sphagnum recurvum* and *Sphagnum cymbifolium* in solutions of dif-

ferent initial pH. Both species of Sphagnum are able to reduce the pH when grown in a weakly alkaline solution; *Sphagnum recurvum* causes an increase of the pH when the initial pH is too low for its development, whereas *Sphagnum cymbifolium* perishes under these conditions.

Those different theories and experiments are fully discussed here because our observations made on the pH and the mineral environment of DF 7 might be explained by accepting an exchange of the kations of the available chlorides with hydrogen-ions from the Sphagnum cell walls or from the humus of the soil (the above-mentioned, indirect, influence of humus!), which process leads to the formation of free hydrochloric acid.

The amount of chlorine ions determined in DF 7 (when supposed to be present as hydrochloric acid) gives a pH of 3.8.

The field observations were followed by experiments, partly carried out by Dr. W. BEIJERINCK at the Biological Station at Wijster, partly by some of us in the Botanical Institute at Leyden.

The experiments of BEIJERINCK had a preliminary character: plants of *Sphagnum cuspidatum* Ehrh., fa. *plumosum* Paul (a submerse species) and of *Sphagnum magellanicum* Bridel, var. versicolor Warnst. (an emergent species) were brought in flasks containing rain water. Three different series were observed:

a. with living Sphagnum
b. with dead Sphagnum
c. with a recent peat.

A fourth flask, containing rain-water, served as a control.

At regular intervals the pH was determined in the 4 flasks by means of the colorimetric method. The results are shown in the following table:

TABLE V.

	Sphagnum cuspidatum				*Sphagnum magellanicum*			
pH of	living	dead	peat	control	living	dead	peat	control
after 5 min. ...	5.1	5.1	5.1	5.1	5.1	4.8	4.6	5.1
„ 1 hour ...	5.1	4.8	4.8	5.1	5.1	4.2	4.6	5.1
„ 5 hours...	5.0	4.6	4.5	5.1	4.4	4.2	4.3	5.1
„ 7 „ ...	5.0	4.6	4.5	5.1	4.4	4.2	4.3	5.1
„ 22 „ ...	5.0	4.5	4.4	5.1	4.2	4.2	4.2	5.1
„ 24 „ ...	5.0	4.5	4.4	5.1	4.2	4.2	4.2	5.1
„ 2 × 24 h.	5.0	—	—	—	4.1	4.1	4.1	5.1
„ 3 and 4 × 24 hours no more change.								

Another series of, more exact, experiments were undertaken:

Equal volumes of water-soaked *Sphagnum cuspidatum* and *Sphagnum cymbifolium* were submersed in equal volumes of rain water, which had been standing during 24 hours in Erlenmeyer-flasks of Jena-glass in which time the pH did not change.

Table VI shows the results of these experiments:

TABLE VI.

	Sphagnum cuspidatum		*Sph. magellanicum*		control
	pH of living	dead	living	dead	water
after ½ hour	5.3	5.0	5.0	4.8	5.3
„ 3 „	5.2	4.6	4.4	4.3	5.3
„ 6 „	5.1	4.5	4.4	4.3	5.3
„ 24 „	5.1	4.5	4.4	4.3	5.3

„ 2 and 3 × 24 hours no further changes were observed.

The experiments of BEIJERINCK show the influence exerted by the Sphagnum plant on its environment. Whether this influence (the decrease of the pH) is due to the secretion of acids or to an exchange of ions does not appear from these observations.

Further experiments were carried out by Mr. K. VAAS.

A culture of *Sphagnum cymbiolifum* was used. The plants were placed in Erlenmeyer-flasks of quartz in twice distilled water; we may expect no measurable ion-exchange between the quartz and the water. Thus, if the Sphagnum secretes an acid the pH of the distilled water should show a decrease. On the contrary, a slight increase was observed after the lapse of two days, probably due to the changes in the carbon dioxide tension as influenced by photosynthesis and respiration.

By this experiment evidence was obtained that the Sphagnum plants do not produce acids in the medium in which they grow.

Other experiments were carried out by placing the Sphagnum plants in a very diluted solution of ammonium chloride in quartz or paraffined glass. The composition of the initial solution was exactly determined as well as its pH. During a few days the plants remained in the solution, after which the composition and the pH were reexamined.

Without any exception the amount of ammonium-ions had decreased, whereas no change could be observed in the amount of chloride-ions.

The pH often decreased but there seemed to be no definite correlation between this decrease and the amount of NH_4^+ absorbed by the plants. The uncertainty of these results is in part due to the relative

precision in the method of the NH_4^+ — and Cl^- determination. The latter determination is inexact when compared with the NH_4-determination, which was carried out spectrocolorimetrically. It seems therefore possible that small amounts of chloride or chloride-ion were also absorbed by the moss. Neither were influences of photosynthesis and respiration excluded. It seems more promising to carry out future investigations with dead Sphagnum, inasmuch as this material seems equally capable of ionic-exchange. As these investigations would be non-biological, we shall have to rely in the future upon the results of colloid-chemists.

The possibility mentioned by FREUNDLICH, according to which the exchanged kation does not need to be hydrogen but may very well be a metal, also has to be investigated and might have obscured the results of our experiments.

At present the exchange-theory seems the only one, however, which may account for the observed facts.

9. Temperature of air and water.

A maximum and minimum thermometer were placed in a distance of 15 cm. from the bottom in the Caricetum. The temperatures shown by this thermometer differed 1—2° C. from the temperature observed by the meteorological substation at Wyster. This difference may be due to the higher position of the latter thermometer which was placed at a height of 2.25 m. During 24 hours the temperature varied from 15.3° C.—22.0° C.

The water-temperature showed a marked lag in relation to the air temperature and the fluctuations are damped as compared to the air temperature. The bottom of the pond was always colder. Inverse stratification did not occur.

Humidity.

The humidity-data of the environment were obtained by means of a psychrometer of a very simple construction: the different temperatures of a dry-bulb and a wet-bulb thermometer were used as a measure for the humidity of the air. The "Carrier Engineering Corporation's Psychrometric Chart" mentioned by SHELFORD (41), gives the correlation between temperature of wet and dry bulb and percentage of relative humidity. The relative humidity varied from 70—97 %. The influence of a rainstorm was shown by a sudden increase from 92 % tot 95 % of relative humidity in the afternoon of August 30th.

The evaporimeters used for the measurement of the evaporation

in different layers were constructed of the type of the porous cup atmometer. On the top of a calibrated tube was placed a cup with porous walls; a cotton wick reached from the cup into the water. Evaporation was determined by measuring the loss of water in the calibrated tube. As the instrument had not been standardized, only relative observations resulted from this method.

The atmometers were placed on different levels in the Sphagnetum: 0, 5, 10 and 15 cm. from the bottom. The observations showed a larger amount of evaporation at the bottom — in the Sphagnetum — than was found in the higher layers. Those observations lead us to the view that possibly the Sphagnum should be able to diminish the humidity of the atmosphere by an intensive absorbtion of the atmospheric water.

The following experiments were carried out at the Laboratory at Leyden by Miss A. KRIJTHE and Mr. H. VERDAM to investigate the absorbtive capacity of Sphagnum.

Plants of *Sphagnum cymbifolium* were dried in a desiccator over sulphuric acid during two days. Aliquots of this dried Sphagnum were brought under a bell-jar in which was placed a solution of sodium chloride of a known molarity. The material was placed on the scale of a balance and fixed to the beam by means of a paraffined thread which passed through the wall of the bell-jar.

The amount of the water absorbed by the Sphagnum could be determined in this way.

Immersed in water the dried Sphagnum absorbed 10 $\times$ its weight.

TABLE VII.

In the bell-jar above water-rel. humidity 100 % Sph.-absorbs $\pm$ 2 $\times$ its weight.

In the bell-jar above 1 mol. NaCl rel. humidity 96.4 % Sph.-absorbs $\pm$ 1 $\times$ its weight.

In the bell-jar above 2 mol. NaCl rel. humidity 91.25% Sph.-absorbs $\pm$ $^1/_2$ $\times$ its weight.

In the bell-jar above 3 mol. NaCl rel. humidity 86.6 % Sph.-absorbs $\pm$ $^1/_3$ $\times$ its weight.

In the bell-jar above 4 mol. NaCl rel. humidity 79.5 % Sph.-absorbs $\pm$ $^1/_4$ $\times$ its weight.

In the bell-jar above 5 mol. NaCl rel. humidity 69.2 % Sph.-absorbs $\pm$ $^1/_5$ $\times$ its weight.

The relation between relative humidity of the air and amount of water absorbed by Sphagnum is clearly shown by the experiments.

10. Pollen-analysis.

At point III, the S—W corner, a hole was dug and samples were taken from every 10 cm down to 60 cm, where the hard sand was encountered. The samples were studied by Miss A. Kruthe in the usual way and the relative frequency of the various pollens was

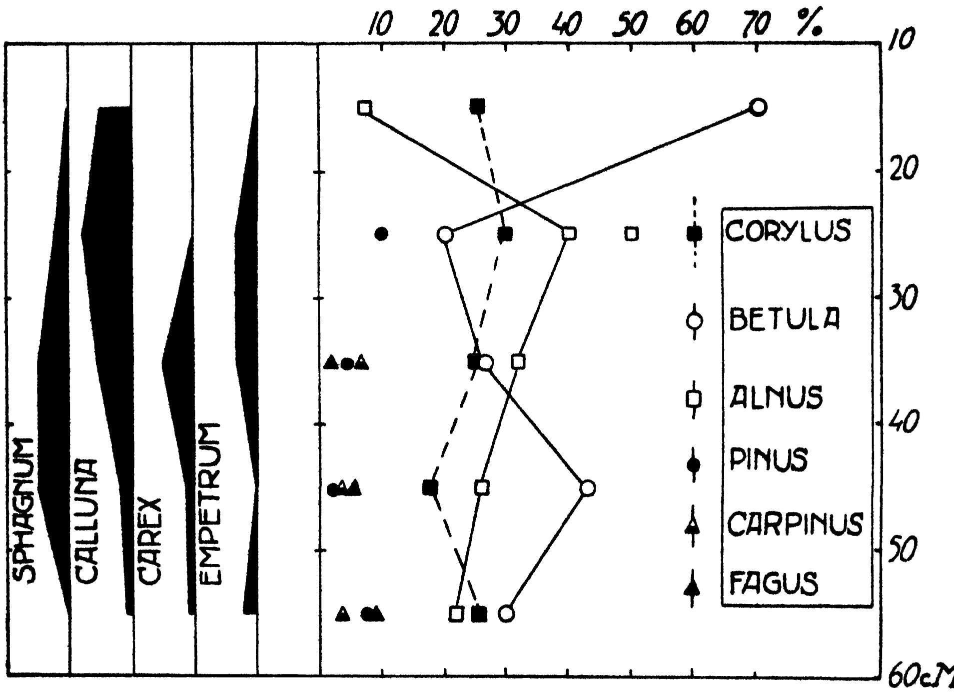


Figure V.
Pollen-diagram from D. F. 7.

established (average of three counts). The % is given of total tree-pollen (genera marked *).

Figure V shows the conventional pollen-diagram as a function of depth. It appears that the only other significant difference from this diagram with other samples from Drenthe (see Florschütz c. s. [14]) is the preponderance of birch-pollen, although the small number of grains found near the surface and near the bank make the percentage-data very uncertain. On the whole, the diagram is characteristic of a young peat of the sub-atlantic to subboreal type. A "pollen archive" of recent plants proved to be very useful. By means of this collection

TABLE VIII.

Depth / Genera	10–20 cM. roots and sand		20–30 peat and sand		30–40 dry peat		40–50 wet peat		50–60 sandy peat	
	freq.	°/₀	freq.	°/₀	freq.	°/₀	freq.	°/₀	freq.	°/₀
*Betula.	3	70	2	20	33	26	132	43	14	30
*Alnus		6	4	40	42	32	77	26	10	22
*Tilia.					2	2	5	2	1	2
*Fagus					2	2	10	4	4	8
*Quercus. . . .					2	2	5	2		
*Corylus . . .	1	24	3	30	32	25	49	17	12	26
Myrica					3		39		8	
Sarothamnus.	2		2		5		19		3	
*Salix						1				
*Pinus			1	10	14	3	5	2	4	8
Sphagnum . .	5		12		57		55		4	
Carex	2		1		52		18		12	
Calluna	10		15		11		3		3	
Erica			5		4		5		1	
Empetrum . .									1	
Andromeda .	2		2				1			
Vaccinium . .			4				1		1	
Genista . . .					1		12		1	
Melampyrum							1			
Euphrasia . .					3		10			
Gentiana . . .							4			
Campanula. .							5			
Drosera									1	
Eriophorum .			1		2				1	
Polypodium .							2			
Lycopodium?										
*Carpinus. . .					9	7	10	4	2	4
	25.5		52.25		265		468		83.75	

a fair picture could be obtained of the flora of the strata 30—40 and 40—50 cm respectively.

In the former stratum *Carex, Eriophorum* and *Calluna* occur abundantly, while *Myrica, Genista, Euphrasia* and *Campanula* are more frequent in the deeper layer, where *Calluna* is less frequent. In both cases the dominant trees are birch and alder. The frequency of some plants is given in Table VII together with the tree-pollen.

It may be that the "bank", which forms the lower boundary of the peat, corresponds to the sandy bottom of the pool, and that another layer of plant remains may occur below this stratum.

From this survey it seems, however, that the peat of D. F. 7 is of comparatively recent origin; there appears to be no reason to date it earlier than the subboreal.

The Life-Cycle in a Sphagnum-Bog.

From our field and laboratory experience, scanty as it is, supplemented by a study of the literature, a concept of the life-cycle in a Sphagnum-bog may be derived.

Oligotrophic by the low mineral contents, dystrophic by its high acidity, the waters of the bog represent a very special condition, which condition constitutes a specific milieu. The vital counterpart of this milieu gives us the life-cycle, which is dominated by the poverty in electrolyte and in oxygen and by the extremely high acidity.

D. F. 7 apparently is partly ombrogenic, partly soligenic in nature. The rain water which feeds it, contains Calcium, Magnesium, Sodium, Potassium and Ammonia; sulfate, chloride, nitrate, carbon-dioxide, Nitrogen and Oxygen. The kation will be partly exchanged by the Sphagnum for hydrogen-ions, thus causing the high acidity. The sulfate will be reduced to sulphide which, at the low pH, will form H_2S. The oxygen production by photosynthesis is not able to oxidize all of the H_2S. Aerobically, the H_2S may be oxidized to SO_4 again by autotrophonts. Nitrate, if present, will be reduced to nitrogen, while nitrification seems to be inhibited. Due to the presence of butyric acid bacteria, anaerobic fixation of nitrogen does not seem to be excluded.

The formation of methane was demonstrated in the field; anaerobic decarboxylation of lower fatty acids may be its cause. Oxidation of methane and hydrogen is possible, but was not established. Decrease of pH due to the photosynthetic intake of carbon dioxide was only observed in laboratory experiments. In the field the CO_2 contributes

but little to the actual acidity of the bog. The same is true for the organic acids, which occur, moreover, in variable amounts. The presence of valeric- and probably of butyric acid could be demonstrated.

Anaerobic decomposition of cellulose seems very slow; the lignin (or perhaps the ligno-protein) complexes are decomposed but the bacterial components in this process are imperfectly known, despite

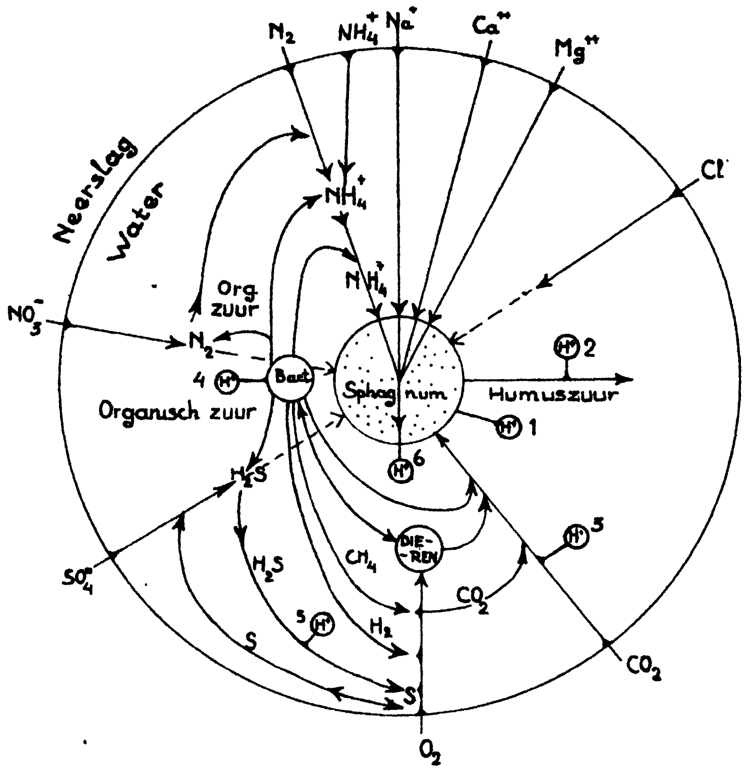


Figure VI.

Life-cycle in a Sphagnum bog.
org. zuur: organic acid.
neerslag: precipitation.
humus zuur: humic acid.
dieren: animals.

the beautiful work of WAKSMAN (52). In view of the work of K. GRIFFIOEN (19) who demonstrated the formation of humic acids from lignins in the heart-wood of Ebony under presumably sterile conditions, it seems possible that many of these reactions might ultimately prove to be non-vital. Figure VI shows a diagrammatical representation of the life-cycle in the bog.

The circumference of the circle represents the boundary of atmosphere and water. From the atmosphere the bog receives Ca^{++}, Mg^{++}, Na^{+}, NH_4^{+}, N_2, NO_3^{-}, $SO_4^{=}$, O_2, CO_2 and Cl^{-}. The processes described above are described by lines and arrows in the figure; the Sphagnum is placed in the centre. From the above it also appears that the chloride-ion, while taken up by the Sphagnum (as may be shown by the ash-analysis) still remains as the biologically-stable component in the water. Due to its preponderance it will act as chief partner for the exchanged hydrogen ions, so that we are driven to the conclusion, mentioned before in this paper, that the reaction of the bog water is chiefly due to hydrochloric acid. As the water is unbuffered, a single rain-storm is sufficient to raise the pH! Presence of buffer (unless it be situated near the equilibrium-pH) might cause the death of the Sphagnum, in accordance with the observations of STELMACH (44) and SKENE (43). Photosynthesis seems most active in the emerged parts of the moss. The conduction of water (according to experiments by Dr W. BEIJERINCK) seems to be downward, which seems to be in harmony with the findings of Miss BOWEN (9) for other mosses. While Sphagnum seems able to absorb moisture from the atmosfere, the amount taken up by this process seems hardly sufficient to saturate it fully with water.

A capillary film of liquid water has to be present at its exterior. Indications of a "vapour layer" from 5—10 cm above the bog could be obtained from atmometer-observations, although a definite proof is lacking. During the short period of our observations, no significant differences could be observed between water and air temperatures, although on top of the Sphagnum "cushions" very high temperatures have been recorded.

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THE CORNACEAE, SENSU STRICTO, OF THE NETHERLANDS INDIES

by

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After Mr. S. BLOEMBERGEN had planned a revision of the *Cornaceae, sensu amplissimo,* of the Netherlands Indies (inclusive those of the Malay Peninsula and the non-Dutch parts of Borneo and New Guinea) and had received, for that purpose, herbarium materials from different institutes, it appeared desirable to him to confine his revision to the *Alangiaceae.* I therefore took the *Cornaceae, sensu stricto,* for my account. It was very convenient to me that Mr. BLOEMBERGEN had already composed a nearly complete list of literature wanted.

The herbaria of which materials have been worked up in this revision, are the following.

B = Herbarium of the Botanic Garden, Buitenzorg, Java.
Be = Herbarium of the Botanic Garden, Berlin—Dahlem.
L = State Herbarium, Leiden.
S = Herbarium of the Botanic Gardens, Singapore.
U = Herbarium of the University, Utrecht.

I feel very thankful to the Directions of these herbaria for their kindness of sending me the materials on loan.

As a result of this revision I will mention in the following only 11 species as indigenous to the area accepted. This is due to the fact, that I thought it necessary to unite the many species mentioned for the area to a smaller number of polymorphic ones. No new species have been described, though several new varieties of *Mastixia tetrandra* had to be distinguished.

Moreover I am in doubt, whether the genus *Mastixiodendron* really belongs to this family.

Key to the genera.

Ovary inferior, one-celled. Calyx-lobes not deciduous.
Stipules none ... ... **Mastixia,** p. 47.
Ovary semi-inferior, two-celled. Calyx lobes deciduous.
Stipules large, interpetiolary, contort, deciduous... **Mastixiodendron,** p. 69.

MASTIXIA.

BLUME, Bijdr. Fl. Ned. Ind., 13, p. 654 (1825); D. C., Prodr., 4, p. 275 (1830); G. DON, Gen. Hist. Dichl. Pl., 3, p. 401 (1834); MEISN., Gen. pl., p. 153 (1838); ENDL., Gen. pl., p. 799 (1839); BLUME, Mus. Bot. Lugd. Bat., 1, p. 256 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 771 (1856); BAILLON, Adansonia, 5, p. 184 (1864—65); BENTH. & HOOK.F., Gen. pl., 1, p. 950 (1867); BAILLON, Hist. d. pl., 7, p. 255 (1879); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 745 (1879); BOERL., Handl. Fl. Ned. Ind., I, 2, p. 654 (1890); TRIMEN, Handb. Fl. Ceyl., 2, p. 286 (1894); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KOORD. & VAL., Bijdr. Booms. Java, 5, p. 86 (1900); SMITH, Bull. Inst. Bot. Buitenz., 11, p. 10 (1901); KING, Journ. As. Soc. Beng., 71, 2, p. 72 (1902); BRANDIS, Ind. trees, p. 356 (1906); WANGERIN, in ENGL., Pflanzenr., IV, 229, p. 19 (1910); KOORDERS, Exkursionsfl. Java, 2, p. 730 (1912); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1916); RIDLEY, Fl. Mal. Pen., 1, p. 889 (1922); KOORD., Fl. Tjib., 2, p. 237 (1923); EVRARD, in LEC., Fl. Indo-Ch., 2, p. 1194 (1923); MELCHIOR, in ENGL., Jahrb., 60, p. 167, 171 (1925); *Mastyxia* SPACH, Hist. Vég. Phan., 8, p. 88 (1839); *Bursinopetalum* WIGHT, Ic. pl., III, 3, p. 4 (1847).

The *Mastixiae* are trees of normal habit, with an erect, cylindric bole, that occupies about 0.6 of the total height of 10 to 35 m. The twigs and leaves are of medium or small, rarely rather large, dimensions. The flowers are disposed in triads (simple cymes) that are again united into more or less many-flowered corymbs. Dimensions and structure of the flowers show little variation. In the characters of the calyx tube, the corolla, the stamens, the style and the fruit I could not find differences for specific distinction. The differences that proved most valuable for that purpose are the following.

1. *The shape of the calyx teeth*, especially the relation between length and width. A part of the species have calyx teeth less than half as long as broad. There is some difference in this respect between the species of this group, but if in acuminate calyx teeth the acumen is excepted, and very young flower buds are left out of consideration, it is never doubtful whether a species is short- or long-toothed. The other species have calyx teeth, the length of which is at least ¾ of the breadth, usually, however, about as long as broad.

2. *The phyllotaxis*. There are species with the leaves spread and others with the leaves opposite. Though a sharp distinction of species,

by means of this character only, is not possible, it is a valuable distinction for determination. Species with opposite leaves often have, here and there, the leaves of one pair more or less remote from each other, and in very young specimens of *Mastixia trichotoma,* a species with normally opposite leaves, the leaves are entirely spread. Also it deserves mentioning, that I could not separate, as a species, *M. Margarethae,* with spread leaves, from *M. rostrata,* with opposite leaves. The difference in phyllotaxis causes moreover a difference in appearance of the young twigs and of the inflorescence, as opposite leaves cause strongly flattened internodes and pseudotrichotomous inflorescences, whereas in species with the leaves spread the twigs and inflorescences have not these characteristics.

3. *The 4- or 5-merous flowers.* It rarely occurs (as I sometimes saw in *M. philippinensis*), that in one inflorescence 4-merous and 5-merous flowers occur intermingled. Most species have the flowers either all of them 4-merous or all 5-merous. Yet the 4-merous species and the 5-merous species, each as a group, show no closer relation at all, and it is, therefore, quite incomprehensible, how WANGERIN could base subgenera on this difference. Between the 5-merous *M. korthalsiana* and the 4-merous *M. trichotoma,* there are no further differences at all, and the number of flower parts only I could not judge sufficient for specific distinction.

4. *The dimensions of twigs and leaves.* It is possible to distinguish certain species with very slender twigs and small leaves from others with coarse twigs and medium-sized or large leaves. *M. rostrata* and *M. bracteata* are, for instance, always typically slender and small-leaved, though in all other important characters they are different. Only in *M. trichotoma* I united the small-leaved slender *M. acuminatissima* and *M. clarkeana* with other, coarser and larger-leaved forms, as there undoubtedly exists a series of intermediate forms.

Key to the species.

1a Length of the calyx teeth at most one-half of their width... 2
b Length of the calyx teeth at least three-quarters of their width, usually the teeth as long as broad 6
2a Flowers 5-merous... 3
b Flowers 4-merous... 5
3a Leaves spread; also the primary branches of the inflorescences spread 4
b Leaves opposite or nearly so, inflorescence several times trichotomous ... ... **3. M. kaniensis,** p. 51.

4a	Normal leaves not more than 6 cm long and 3.5 cm broad. Twigs slender. Lowers branches of the inflorescences nearly 9-flowered	5. **M. bracteata**, p. 54.
b	Normal leaves 8—18 cm long, 3—9 cm broad. Twigs robust. Lower branches of the inflorescences nearly 27-flowered	1. **M. pentandra**, p. 49.
c	Cfr. also 6. **M. cuspidata**, p. 55.	
5a	Leaves opposite or spread, long-cuspidate, the cuspis 6—20 mm long, 1—1.5 mm broad, usually somewhat spathulate. Twigs slender	4. **M. rostrata**, p. 52.
b	Leaves spread, at most shortly acuminate. Twigs rather robust	2. **M. parvifolia**, p. 51.
6a	Leaves spread. Primary branches of the inflorescences also spread	 7
b	Leaves opposite or nearly so. Inflorescences several times trichotomous	9. **M. trichotoma**, p. 57.
7a	Flowers 5-merous	7. **M. Scortechinii**, p. 56.
b	Flowers 4-merous	8. **M. tetrandra**, p. 56.

1. **Mastixia pentandra** — A tree 12—34 m high, its bole 18—75 cm in diameter at a height of 1.5 m, 13—50 cm in diameter below the crown (according to herbarium labels). Twigs bearing adult leaves 2—6 mm thick. Leaves spread; petiole 10—45 mm long; lamina elliptic to oblong or more obovate, (5)8—18 cm long, (2)3—9 cm broad, contracted into the petiole below the rounded base or quite cuneate, with an obtuse cuspis up to 20 mm long 2—4 mm broad, thin-coriaceous, the secondary lateral nerves nearly transverse. Corymb with spread primary branches, usually three times branched below the triads; bracts of the lower branches usually linear, 5—15 mm long, obtuse, falling off during the development of the flowers, the upper ones shorter and narrower, remaining longer. Calyx limb nearly 1 mm long, cut halfway down into 5 very short and broad obtusely acuminate teeth. Style 0.5—1.5 mm long. Fruit ellipsoidal, often more or less ovate or obovate, 18—37 mm long, 15—17 mm in diameter, with differently developed disc. Indumentum silky in the young parts, none on the adult leaves and twigs, more densely and appressedly silky on the inflorescences towards the extremities and on the flowers, usually disappearing before the ripening of the fruit.

Mastixia pentandra BLUME, Bijdr., 13, p. 654 (1825); D. C., Prodr., 4, p. 275 (1830); G. DON, Gen. Hist. Dichl. Pl., 3, p. 401 (1834); HASSK., Cat. Pl. Hort. Bot. Bog., II, p. 168 (1844); BLUME, Mus. Bot. Lugd. Bat., 1, p. 256 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 771 (1856), p. 1095 (1858); suppl. Sum., p. 135 (1860); BAILLON, Adansonia, 3,

p. 83, nota (1862); TEYSM. & BINN., Cat. Pl. Hort. Bot. Bog., p. 169 (1866); ? CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 746 (1879) excl. synon.; HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KOORD. & VAL., Bijdr. Kenn. Booms. Java, 5, p. 88 (1900); ? GAMBLE, Man. Ind. Timb., ed. 2, p. 391 (1902); BRANDIS, Ind. trees, p. 356 (1906); MERRILL, Ann. Jard. Bot. Buitenz., suppl. 3, 1, p. 283 (1910) p.p.; WANGERIN, in ENGL., Pflanzenr., IV, 229, p. 20, 26 (1910) excl. var. *cuspidata*; KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 104 (1912) p.p.; KOORDERS, Exkursionsfl. Java, 2, p. 732, 734 (1912) p.p.; *Mastixia megacarpa* RIDL., Fl. Mal. Pen., 1, p. 891 (1922); *Mastixia Ledermannii* MELCHIOR, in ENGL., Jahrb., 60, p. 172, 173 (1926).

I have united *M. Ledermannii* and *M. megacarpa* with *M. pentandra*, as I could not discover sufficient differences. Perhaps *M. arborea* (WIGHT) CLARKE, and *M. philippinensis* WANGERIN, are only geographical variations of the same species. Sterile materials of *M. pentandra* I cannot distinguish from *M. tetrandra*, but as *M. tetrandra* is rare in the area dealt with, I reckoned such materials provisorily to *M. pentandra*.

MALAY PENINSULA. Penang: (locality illegible) HANIFF 3759 (S); Pulu Butong Reserve, 300 m, CURTIS 919 (S), type of *M. megacarpa* RIDL.; Pahang: Fraser Hill, 1200 m, NUR 11291 (S, B); Fraser Hill, southern slope, 1200—1350 m, BURKILL & HOLTTUM 7840 (S).

SUMATRA. Palembang: Banjoe-Asin- & Koeboe-streken, 20 m, GRASHOFF 895 (B) v.n. *kajoe reboeng*; 15 m, Boschpr. bb. 158 E. 1 P. 850 (B, L) partly, cfr. *M. tetrandra*.

BORNEO. Eastern Part, near Long Petah, 450 m, ENDERT 3310 (B).

JAVA. "Harriang", VAN HASSELT (L) v.n. *tenjau*; without exact locality, for the greater part authentic specimens of *M. pentandra* BLUME, partly cultivated in the Buitenzorg Botanic Gardens, probably partly from the original locality, *i.e.* "Salak, Burangrang" (ex BL., *l. c.*); G. Boerangrang (B); G. Tangkoebanprahoe, KORTHALS (L); Pasoeroean, Toerèn, Zuidergebergte near Soembertangkil, 400—500 m, KOORDERS 23785 β, forest number 305* (B, L); KOORDERS 23801 β, forest number 1547* (B, L).

NEW GUINEA. North-eastern Part, Etappenberg, 850 m, LEDERMANN 9575 (Be), type of *M. Ledermannii* MELCHIOR.

Sterile materials, perhaps partly *M. tetrandra*:

SUMATRA. Westkust: Oud-Agam, Bantjok Dalam, 900 m, boschproefstation bb. 7415 (B) v.n. *djao*; Bengkoeloe: Redjang, Kep. Tjoeroep, northern slope of Bt. Kaba, 1100 m, boschpr. bb. E. 1053 (B, L); Palembang: Moesi Ilir, Ipil, 9 m, boschpr. bb. TB. 1085 (B) v.n. *boeng*.

BANGKA. Rindik, 10 m, boschpr. bb 11581 (B) v.n. *mengkapas.*

BORNEO. South-eastern Part, Poerock Tjahoe, Kp. Mocara Laoeng, 80 m, boschpr. bb 10028 (B) v.n. *pangoan poetih*; Boeloengan, near Salimbatoe, S. Pingping, 150 m, boschpr. bb. 11177 (B) v.n. *baoer toeas,* and S. Roemah, 150 m, boschpr. bb. 11180 (B).

2. **Mastixia parvifolia** — Twigs bearing full-grown leaves 1—2.5 mm thick. Leaves spread; petiole 5—13 mm long; lamina obovate or oblong-obovate, 2.5—5.5 cm long, 1.2—2.5 cm broad, cuneate at the base, shortly obtuse-acuminate at the apex, rather thickly coriaceous, with secondary lateral nerves not transverse and not distinguishable from the veins. Corymbs with spread primary branches, usually two or three times branched below the triads; lower branches in the axils of normal leaves, bracts unknown (fallen off in the materials available). Calyx limb with 4 very short teeth. Fruit (unripe) ovate-oblong, up to 20 mm long, 10 mm in diameter. Indumentum none (or already fallen off).

Mastixia parvifolia HALLIER, Beih. Bot. Centralbl., 34, 2, p. 41 (1916); MELCHIOR, in ENGL., Jahrb., 60, p. 172 (1925).

M. parvifolia is, with certainty, only known from the type materials, that are in fruit. Therefore we can say little about it affinities. The twigs and leaves resemble those of a small-leaved *M. pentandra,* as do the small calyx teeth, but the flowers are 4-merous. The small, hard leaves make it probable, that the type might be a mountain form of a more polymorphic species. Yet the further materials enumerated below are doubtful, especially those from Selebes. The specimen from Mt. Kinabalu is only a small fruit-bearing twig terminated by a short raceme of triads, but the leaves are up to 16 cm long, 7 cm broad.

BORNEO. G. Damoes, near the Nijoet, HALLIER B. 569 (B, L), type.

Doubtful:

BORNEO. Mt. Kinabalu, Marai Parai, 1500 m, CLEMENS s. n. (B).

SELEBES. Southeastern Peninsula, Bt. Watoewila, 1500 m, KJELLBERG 1085 (B), "small tree".

3. **Mastixia kaniensis** — Internodes bearing full-grown leaves nearly 2.5 m thick in the lower part, up to 1.5 times as broad towards the top. Leaves opposite; petiole 7—13 mm long; lamina elliptic-oblong or somewhat obovate, 5—11 cm long, 1.5—4 cm broad, cuneate at the base, protracted in a 5—10 mm long, 1.5—3 mm broad cuspis, thin-coriaceous, with secondary lateral nerves distinct, transverse, somewhat arcuate. Corymbs 3—4 times trichotomous below the triads, the lower branches in the axils of normal leaves, the further bracts short, triangular, falling off after anthesis. Calyx limb nearly 0.75 mm long,

with 5 teeth that are short and broad, rounded with a very short acumen. Style nearly 0.75 mm long. Fruit unknown. Indumentum thin and silky on the young parts, soon falling off or remaining on the extremities of the inflorescences and on the flower buds.

Mastixia kaniensis MELCHIOR, in ENGL., Jahrb., 60, p. 172 (1925).

This species comes near to *M. pentandra* by its 5-merous flowers with short calyx teeth, but is different by the opposite leaves and consequently trichotomous inflorescences. The latter character is very striking and causes a resemblance with *M. trichotoma*, but I suppose that it is not of a great systematic value, and if this might be right the difference with *M. philippinensis* and *M. pentrandra* would be unimportant.

NEW GUINEA. North-eastern part, Kani Mountains, 1000 m, SCHLECHTER 17061 (Be, type, L, cotype of *Mastixia kaniensis* MELCH.); *ibidem*, SCHLECHTER 17703 (L).

PHILIPPINE ISLANDS. Mindanao, Bukidnon, Mt. Candoon, B. Sc. 38841 (Be, L).

4. **Mastixia rostrata** — Tree, usually 10—28 m high, with a bole 20—50 cm in diameter at a height of 1.5 m (according to herbarium labels). Young internodes 1—2 mm thick at the base, up to 1.5 time as broad at the top. Leaves either opposite few of them spread, or all of them spread; petiole 8--12 mm long; lamina elliptic to oblong or somewhat obovate, 4—10 cm long, 1—4 cm broad, contracted below the rounded base or cuneate at the base, more or less abruptly cuspidate at the apex, with a cuspis 6--20 mm long, 1—1.5 mm broad, very obtuse, distinctly spathulate, thin-coriaceous, with secondary lateral nerves difficultly to be distinguished from the veins, not transverse nor arcuate. Corymbs rather small, 3—4 times trichotomous below the triads or the primary branches spread; all bracts small and acute. Calyx teeth 4, very short, rounded or very shortly acuminate. Style 1—2 mm long, rarely shorter. Fruit 15—20 mm long, 9—10 mm thick, ovate. Indumentum thinly to rather thickly silky, permanent on the extremities of the inflorescences, on the nodes, and on the underside of the petiole and the midrib.

Mastixia rostrata BLUME, Mus. Bot. Lugd. Bat., 1, p. 258 (1850); MIQ. Fl. Ind. Bat., I, 1, p. 773 (1856) & 1095 (1858); TEYSM. & BINN., Cat. Pl. Hort. Bot. Bog., p. 169 (1866); HARMS, in ENGL. & Pr., Nat. Pflanzenfam., III, 8, p. 262 (1898); KOORD. & VAL., Bijdr. Booms. Java, 5, p. 92 (1900); WANGERIN, in ENGL., Pflanzenr., IV, 229, p. 20, 22 (1910); KOORD.-SCHUM., Syst. Verz., I, 1, fam. 229, p. 104 (1912);

KOORD., Exkursionsfl. Java, 2, p. 732, 734 (1912); KOORD. & VAL., Atlas, 1, tab. 191 (1913); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1917); MOLL & JANSSON., Mikrographie, 3, p. 729 (1918); RIDL., Fl. Mal. Pen., 1, p. 890 (1922) p.p.?; *Mastixia Junghuhniana* MIQ., Pl. Jungh., p. 426 (1855); Fl. Ind. Bat., I, 1, p. 772 (1856); ? HARMS, in ENGL., Nat. Pflanzenfam., III, 8, p. 262 (1898); *Mastixia Margarethae* WANGERIN, in FEDDE, Repert., 4, p. 335 (1907); in ENGL., Pflanzenr., IV, 229, p. 20, 21 (1910); *Mastixia cuspidata* var. *Margarethae* HALLIER, Beih. Bot. Centralbl., 34, 2, p. 41 (1917); *Mastixia caudatifolia* MERRILL, Univ. Calif. Publ. Bot., 15, p. 233 (1909).

There are, indeed, small differences between the Java and Flores specimens with usually opposite leaves, described as *M. rostrata* and as *M. Junghuhniana,* and those from Sumatra and Borneo with spread leaves, and there are other small differences between the Sumatra specimens, described as *M. Margarethae* and the Borneo ones described as *M. caudatifolia,* but these differences appeared insufficient for specific distinction.

In ascribing a "drupa globosa" to *M. Junghuhniana,* MIQUEL was certainly in error; he might have described fruit-galls, as globose fruit-galls indeed occur in several *Mastixia* species.

CLARKE's *M. Junghuhniana* is *M. trichotoma.* RIDLEY's *M. rostrata* is certainly *M. trichotoma* for the greater part; perhaps MAINGAY's specimen cited by RIDLEY is right.

It is not clear how HALLIER, in his excellent publication on *Mastixia,* could take the 4-merous *M. Margarethae* as a variety of the 5-merous, insufficiently known *M. cuspidata.*

MALAY PENINSULA. Malacca, MAINGAY 709 (according to WANGERIN).

SUMATRA. Oostkust: near Badjalinggi, south of Tebingtinggi, 100 m, LÖRZING & JOCHEMS 7504 (= Deli-Proefstation 1380) (B); Westkust: on the Soengai Boeloe, 0 m, BECCARI P. S. 956 (L, type of *M. Margarethae* WANG.); Soeliki, near Moedik Liki, 900 m, boschpr. bb. 3988 (B), v.n. *tapih (?).*

BORNEO. North Borneo: Mt. Kinabalu, Penibukan, 1200 m, CLEMENS 32101 (B); Elphinstone Prov., Tawao, ELMER 21584 (B, Be, S, U, cotypes of *M. caudatifolia* MERR.) & ELMER 21870 (B, Be, S, U) second number cited by MERRILL; West Borneo: Long Hoet, 130 m, ENDERT 2577 (B); near the Kong Kemoel, 1600 m, ENDERT 4317 (B).

JAVA. Without exact locality: BLUME (U); "Progan" BLUME (L); JUNGHUHN (L, U, the former original of *M. Junghuhniana* MIQ.), v.n. *tjangkar*; Nirmala, native collector 193 (B) v.n. *daon kitadjas*; Nirmala,

Oetan Nangkok Botol, native coll. 41 (B) v.n. *daon kajoe tendjo*; G. Salak, 1000 m, KOORDERS 33268 β (B); near Kp. Bodjong, KOORDERS 24218 β, forest number 932* (B, L) v.n. *kitindjo, kitendjo*; G. Gedé, REINWARDT ?, houtsoort 645 (L) v.n. *kiboeray lalakina*; Takokak, forest G. Aseupan, KOORDERS 32860 β, forest number 1558* (B) v.n. *kitendjo*; Takokak, KOORDERS 9885 β, forest number 2090a (B) v.n. *kitendjo*; Takokak, 1050 m, KOORDERS 915 β (B, L) 11915 β (B, L), 11916 β (B, L), 25556 β (B, L), 32681 β (B), 37260 β (B), all with the forest number 2138a; KOORDERS 11917 β (B, Be, L, S, U) & 25634 β (B, Be, L) v.n. *kitendjo*, & 25735 β (B, Be, L) forest number 2309a; 25755 β (B, Be, L) v.n. *kilejas*; Pasir Padakati, 1035 m, KOORDERS 9901 β (B, L); Tjigenteng, KOORDERS 30123 β (B); Pasir Djamboe, 1400—1700 m, KOORDERS 26319 β, forest number 323* (B, L, S, U); Pengalengan, 1300 m, JUNGHUHN 168 (L, U, originals of *M. Junghuhniana* MIQ.); Pengentjongan near Garoet, 1400 m, KOORDERS 14081 β (B), Banjoemas, Pringombo, forest Grendeng, 800 m, KOORDERS 38076 β, forest number 157* (B, L); Pringamba, top G Boetok, 1000 m, KOORDERS 39016 β, forest number 24* (B, L).

FLORES. Ende, Kp. Walo Lele, 1000 m, boschpr bb. 12609 (B), v.n. *tapaaèkè*; Kp. Boa Feo, 900 m, boschpr. bb. 8922 (B, L) v.n. *raoe*, & bb. 8925 (B, L) v.n. *sje*.

5. **Mastixia bracteata** — Tree 12—16(—30?) m high, with a bole 15—20(—40?) cm in diameter (according to herbarium labels). Young internodes bearing full-grown leaves 1—1.5 mm thick at their base. Leaves spread; petiole 5—10 mm long; lamina elliptic to obovate or more oblong, 3—6 cm long, 2—3.5 cm broad, with cuneate base or contracted into the petiole below the rounded base, more or less abruptly acuminate, the acumen 5—10 mm long, 1.5—2 mm broad, obtuse, often more or less spathulate, thin-coriaceous, the secondary lateral nerves difficultly to be distinguished from the veins, indistinctly or rather distinctly transverse. Corymbs once or twice branched below the triads with spread branches; lower bracts leafy, either common small leaves, or lanceolate obtuse, gradually or more abruptly diminishing into the upper small triangular or more filiformous bracts. Calyx limb cupuliformous, with 5 short, broad teeth. Fruit not known. Indumentum rather densely silky in the young parts, appressed, less dense later, the leaves soon quite glabrous.

Mastixia bracteata CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 746 (1879); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KING, Journ. As. Soc. Beng., 71, 2, p. 73 (1902); WANGERIN, in ENGL.,

Pflanzenr., IV, 229, p. 20, 26, ic. 1, G—K, N—O (1910); RIDLEY, Fl. Mal. Pen., 1, p. 891 (1922).

Resembles *M. pentandra* by the short calyx teeth, is, however, quite different in general appearance, by the slender twigs and small leaves, which it has in common with *M. rostrata* and *M. trichotoma* var. *clarkeana*. I have not seen the type number MAINGAY 710, but I have seen the number KING's coll. 6830, cited by CLARKE.

MALAY PENINSULA. Perak: Larut, within 30 m, KING's coll. 6830 (B, Be, L); Malacca: Selandau, 0 m, HOLMBERG 840 (S), v.n. *dadaru*.

SUMATRA. Palembang: Banjoe-Asin- & Koeboe-streken, 5—20 m, boschpr. 68 T. 1 P. 124 (B, L), v.n. *k. koendoer* and *beboeng*.

BORNEO. Sarawak: BECCARI P. B. 1559 (B); Mt. Dulit, Ulu Tinjar, near Long Kapa, 700—900 m, RICHARDS 1966 (K) v.n. *biansu gunong*.

Without flowers, therefore uncertain:

BANGKA. Perlang, 5 m, boschpr. bb. 11638 (B), v.n. *mengkopas*.

BORNEO. Southern & Eastern Part: P. Tjahoe, Kp. Kalapeh, 200 m, boschpr. bb. 11064 (B) v.n. *mahawai aoe*; East Koetai, Sangkoelirang, Kp. Palawan, 50 m, boschpr. bb. 11963 (B).

6. **Mastixia cuspidata** — Young internodes bearing full-grown leaves 2—3.5 mm thick at their base. Leaves spread; petiole 6—9 mm long; lamina obovate-oblong, 7—12.5 cm long, 2.5—4.5 cm broad, cuneate at the base, abruptly acuminate at the apex, the acumen 6—18 mm long, 1.5—2.5 mm broad, sometimes slightly spathulate, thin-coriaceous, almost chartaceous, the secondary lateral nerves more or less distinctly arcuate. Corymbs 2 to 3 times branched below the triads, with spread branches. Bracts unknown. Calyx teeth 5, very short and broad. Fruit oblong, 22—23 mm long, 8—9 mm in diameter.

Mastixia cuspidata BLUME, Mus. Bot. Lugd. Bat., 1, p. 256 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 772 (1856), p. 1095 (1858); TEYSM. & BINN., Cat. Pl. Hort. Bot. Bog., p. 169 (1866); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40, 41 (1917) excl. var. *Margarethae*; ? DAKKUS, Bull. Jard. Bot. Buitenz., ser. 3, suppl. 1, p. 191 (1930); *M. pentandra* var. *cuspidata* WANG., in ENGL., Pflanzenr., IV, 229, p. 26 (1910).

Very incompletely known, the type specimens consisting of few leafy twigs with flowerless and fruitless inflorescences, and few detached, probably not yet ripe, fruit. By the 5 short calyx teeth, and the appearance of twigs and leaves it resembles *M. bracteata* more than any other species, but it is coarser in all parts and the leaves are more acuminate, whereas the bracts cannot be compared with those of that species. There is also a great resemblance with certain forms of *M. philippinensis*. The second

specimen, mentioned by HALLIER, is quite sterile, and may be as well *M. rostrata* as *M. cuspidata*.

SUMATRA. Probably Westkust: KORTHALS (L, U), originals of the species.

HALLIER reckons to this species also the following sterile specimen:

BORNEO. Boekit Kasian, AMDJAH (Exp. NIEUWENHUIS) 55 (B, L).

DAKKUS *l. c.* mentions *M. cuspidata* as cultivated in the Buitenzorg Botanic Gardens sub III. G. 56 (not 56a), but I did not see any materials of this tree.

7. **Mastixia Scortechinii** — A small tree (ex KING). Young twigs 2—3 mm thick between the full-grown leaves. Leaves spread; petiole 8—15 mm long; lamina obovate to obovate-oblong, 4—9 cm long, 1.5—4 cm broad, acute at the base, acuminate at the apex, the acumen 5—12 mm long, obtuse but not spathulate, the secondary lateral nerves indistinctly transverse, not arcuate. Corymbs 3 to 4 times branched below the triads, with spread branches; bracts all triangular, small, acute. Calyx teeth 5, triangular, nearly as long as broad, acute or slightly acuminate. Fruit unknown. Indumentum on all young parte (probably) rather thinly but densely woolly-tomentose, later remaining only on the buds and nodes, partly also on the inflorescences, falling off from the twigs and leaves.

M. Scortechinii KING, Journ. As. Soc. Beng., 71, 2, p. 73 (1902); WANG., in ENGL., Pflanzenr., IV, 229, p. 21, 27 (1910); RIDLEY, Fl. Mal. Pen., 1, p. 891 (1922).

Of *M. Scortechinii* I only saw one twig in the Leiden and Berlin herbarium each, insufficient to make out whether this species, besides by the 5-merous flowers, is sufficiently different from *M. tetrandra* to be kept apart as a species.

MALAY PENINSULA. Perak: SCORTECHINI 1971 (Be, L, cotypes).

8. **Mastixia tetrandra** — Tree nearly 30 m high, with a bole 36—65 cm in diameter (according to herbarium labels). Young twigs bearing full-grown leaves 2—4 mm thick. Leaves spread; petiole 10—20 mm long; lamina obovate to obovate-lanceolate, 6—8 cm long, 2—4 cm broad, usually acute at the base, shortly and obtusely acuminate at the apex, rather thickly coriaceous, with secondary lateral nerves transverse, not arcuate. Corymbs nearly 4 times branched below the triads, with the primary branches spread; lower branches often in the axils of normal leaves, the further bracts small, acute, triangular. Calyx teeth 4, nearly as long as broad, subobtuse or somewhat acuminate. Fruit not known.

Indumentum almost none, or appressed grayish on the leaf- and flower-buds.

Mastixia lanceolata BAILLON, Andansonia, 3, p. 83, nota (1862) nom. nud.; *Bursinopetalum tetrandrum* TEYSM. & BINN., Cat. Pl. Hort. Bot. Bog., p. 169 (1866) nom. nud.; *Mastixia tetrandra* CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 745 (1879) excl. var.; TRIMEN, Handb. Fl. Ceyl., 2, p. 287, t. 47 (1894) excl. var.; HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KOORD. & VAL., Bijdr. Booms. Java, 5, p. 88 (1900); WANG., in ENGL., Pflanzenr., IV, 229, p. 20, 21 (1910) excl. var.

This species is not distinguishable from *M. pentandra* in the sterile state, but is readily to be distinguished from it by the 4-merous flowers and long calyx teeth. Among the sterile specimens enumerated under *M. pentandra* there might be some of this species. The materials above mentioned quite agree with the type number THWAITES 2441, from Ceylon, in the Leiden Herbarium.

SUMATRA. Tapiannoeli: Angkola & Sipirok, near Kp. Sitoemba, 1440 m, boschpr. bb. 5229 (B, L) v.n. *modang ambogol*; Palembang: Banjoe-Asin- & Koeboe-streken, near Bajoeng Lintjir, 15 m, boschpr. bb. 158. E. 1 P. 850 as far as collected by ENDERT in April 1920, the further materials under the same number being *M. pentandra*; n.v. *reboeng*.

Cultivated in the Buitenzorg Botanic Gardens under III. G. 56a, non 56. Perhaps this is the specimen TEYSMANN & BINNENDIJK mentioned in their catalogue of 1866 as *Bursinopetalum tetrandrum*?

9. **Mastixia trichotoma** — Tree 12—40 m high, the bole 10—150 cm in diameter at a height of 1.5 m (according to herbarium labels). Internodes bearing full-grown leaves 1—10 mm thick in the lower part, up to 1.5 times as broad towards the apex. Leaves opposite or subopposite; petiole usually 10—30 mm long; lamina elliptic to lanceolate or ovate to ovate-lanceolate, usually 5—25 cm long, 2—11 cm broad, cuneate to rounded at the base and contracted into the petiole, acuminate, but not abruptly, the acumen 10—20 mm long obtuse or acute, thin-coriaceous or thick-chartaceous, the secondary lateral nerves distinctly transverse and somewhat arcuate. Corymbs usually 3 to 8 times trichotomous below the triads; lower bracts often more or less foliaceous or even common leaves, most or all of them, however, small, triangular, acute. Calyx lobes 4 or 5, triangular to ovate, often slightly acuminate. Style 0.5—1 mm long. Fruit ovate to oblong, 18—35 mm long, 7—15 mm thick. Indumentum either appressed and grayish, confined to the inflorescences and the young parts, or brownish and woolly, usually soon falling off,

more rarely persistent on the adult internodes and the undersides of the leaves.

Mastixia trichotoma BLUME, Bijdr. Fl. Ned. Ind., 13, p. 655 (1825); D. C., Prodr., 4, p. 275 (1830); G. DON, Gen. Hist. Dichl. Pl., 3, p. 401 (1834); HASSK., Cat. Pl. Hort. Bot. Bogor., II, p. 169 (1844); BLUME, Mus. Bot. Lugd. Bat., 1, p. 257, ic. 58 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 772 (1856) & p. 1095 (1858) cum var. *laxa*; BAILLON, Adansonia, 3, p. 83, in nota (1862); TEYSM. & BINN., Cat. Pl. Hort. Bot. Bogor., p. 169 (1866); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KOORD. & VAL., Bijdr. Booms. Java, 5, p. 90 (1900); WANGERIN, in ENGL., Pflanzenr., IV, 229, p. 20, 24, ic. 1A—E (1910); KOORD.-SCHUM., Syst. Verz., I, 1, fam. 229, p. 105 (1912); KOORD., Exkursionsfl. Java, 2, p. 732, 734 (1912); KOORD. & VAL., Atlas, 1, tab. 190 (1913); KOORD., in ENGL., Jahrb., 50, suppl. p. 291, 293, 302 (1914); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1917); MOLL & JANSS., Mikrogr., 3, p. 722 (1918); KOORD., Fl. Tjibod., 2, p. 238 (1923); BRUGGEM., Bull. Jard. Bot. Buitenz., ser. 3, 9, p. 199, 200 (1927); *Mastixia laxa* BLUME, Mus. Bot. Lugd. Bat., 1, p. 257 (1850) cum var. *angustifolia;* WANGER., in ENGL., Pflanzenr., IV, 229, p. 20, 24 (1910) cum var. *angustifolia*; KOORD., Exkursionsfl., 2, p. 734 (1912); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1917); *Mastixia acuminatissima* BLUME, Mus. Bot. Lugd. Bat., 1, p. 258 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 772 (1856) & 1095 (1858); suppl. Sum., p. 135 (1860); HARMS, in ENGL., Nat. Pflanzenfam., III, 8, p. 262 (1898); WANGER., in ENGL., Pflanzenr., IV, 229, p. 20, 22, ic. 1F (1910); *Mastixia kimanilla* BLUME, Mus. Bot. Lugd. Bat., 1, p. 258 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 772 (1856) & p. 1095 (1858) cum var. *caesia*; TEYSM. & BINN., Cat. Pl. Hort. Bot. Bogor., p. 169 (1866); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KOORD. & VAL., Bijdr. Booms. Java, 5, p. 94 (1900); WANGER., in ENGL., Pflanzenr., IV, 229, p. 20, 25 (1910); KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 104 (1912); KOORD., Exkursionsfl. Java, 2, p. 734 (1912); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1917); *Mastixia caesia* BLUME, Mus. Bot. Lugd. Bat., 1, p. 258 (1850); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1917); *Mastixia Maingayi* CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 746 (1879); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KING, Journ. As. Soc. Beng., 71, 2, p. 74 (1902) cum var. *sub-tomentosa*; WANGER., in ENGL., Pflanzenr., IV, 229, p. 20, 22 (1910); RIDLEY, Fl. Mal. Pen., 1, p. 890 (1922); *Mastixia Junghuhniana* CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 746 (1879) non MIQ.; *Mastixia Clarkeana* KING, Journ. As. Soc. Beng., 71, 2, p. 75 (1902) cum var. *macrophylla*; WANGER., in

ENGL., Pflanzenr., IV, 229, p. 20, 24 (1910) cum var. *macrophylla*; KOORD., Exkursionsfl. Java, 2, p. 734 (1912); RIDLEY, Fl. Mal. Pen., 1, p. 890 (1922) cum var. *macrophylla*; HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1917) cum var. *macrophylla; Mastixia Korthalsiana* WANGER., in FEDDE, Repert., 4, p. 335 (1907); in ENGL., Pflanzenr., IV, 229, p. 20, 25 (1910); HALLIER, Beih. Bot. Centralbl., 34, 2, p. 40 (1917); *Mastixia propinqua* RIDL., Journ. Fed. Mal. States Mus., 4, p. 25 (1909); Fl. Mal. Pen., 1, p. 890 (1922); *Elataeriospermum Tokbray* KOORD., Junghuhn-Gedenkb., p. 173 (1910), non *Elateriospermum Tokbrai* BLUME; *Mastixia pentandra* KOORD.-SCHUM., Syst. Verz., I, 1, fam. 229, p. 104 (1912) p.p., non BLUME; *Vitex premnoides* ELMER, Leafl. Phil. Bot., 8, p. 2874 (1915); *Mastixia premnoides* HALLIER, Beih. Bot. Centralbl., 34, 2, p. 41 (1916); MERR., Phil. Journ. Sc., bot., 13, p. 43 (1918); Enum. Phil. Fl. Pl., 3, p. 242 (1923); MELCHIOR, in ENGL., Jahrb., 60, p. 172 (1925); *Mastixia rostrata* RIDL., Fl. Mal. Pen., 1, p. 890 (1922) non BLUME.

As is evident from the above list of synonyms, I take together, under the collective name of *M. trichotoma*, several forms, that by other authors are distinguished as different species. These forms, however, either show differences too slight for specific distinction, or are connected by intermediate forms.

Among the species distinguished by different authors, *M. trichotoma* BLUME (1825) is characterized by its middle-sized, elliptic to oblong leaves, the yellowish or ochraceous colour of its twigs and undersides of its leaves, the woolly indumentum covering all young parts, permanent on the inforescences, the nodes and the undersides of the leaves.

BLUME himself split off from this species *M. laxa* (1850), somewhat different by less branched inflorescences, larger flowers, and leaves that are only hairy on the underside of the nerves; moreover the leaves are a trifle smaller, more ovate, less acuminate, the inflorescences more densely woolly or nearly floccose.

Of this species BLUME distinguished a variety *angustifolia*, with leaves much smaller and less hairly, and inflorescences still less branched.

M. kimanilla BLUME (1850) has somewhat more ovate, quite glabrous leaves; the indumentum on the other parts in restricted to the young parts and the extremities of the inflorescences, and is more grayish and appressed, not brownish and woolly. Also the colour of different parts is more grayish.

M. caesia BLUME (1850) has blackish twigs and leaves that look somewhat pruinose, but this might be caused by the mode of drying.

For the remainder there is little difference with *M. kimanilla,* of which it can be hardly distinguished as a variety.

M. acuminatissima BLUME (1850) differs much more, and its specific distinction appears quite justified at first sight. Its twigs are more slender, its leaves smaller, more oblong, and long- and acute-acuminate; its colour is grayish, the indumentum grayish, appressed, and nearly restricted to the inflorescences, though also the buds and nodes are slightly hairy. This form, however, cannot be distinguished from *M. clarkeana* and is, together with this form, connected with *M. trichotoma* by intermediate forms.

M. Maingayi CLARKE (1879) is as well distinguished, at first sight, as *M. acuminatissima,* by copious ochraceous or even ferrugineous indumentum, that is permanent and dense on the inflorescences, twigs, petioles and undersides of the leaves; moreover are the leaves more coriaceous, more strongly nerved, and the midrib and primary and secundary lateral nerves are impressed above. The lower bracts of the inflorescences are common leaves or at least somewhat foliaceous, and gradually diminish into the upper small bracts. This remarkable form, however, is connected with *M. trichotoma* by intermediates, one of which was already described by KING as var. *subtomentosa.*

M. clarkeana KING (1902) is little different from BLUME's *M. acuminatissima,* but is quite conspicuous among the forms of the Malay Peninsula. If one would, in spite of the transition forms towards *M. trichotoma,* keep this form upright as a species, it would be impossible to keep it separated from *M. acuminatissima.* It has somewhat ovate, rather small, thin-coriaceous, quite glabrous leaves, somewhat larger and less acuminate than those of *M. acuminatissima.* The indumentum of the inflorescences is grayish and appressed.

M. korthalsiana WANGERIN (1907) is strikingly different by 5-merous flowers, hardly different, however, for the rest from forms such as *M. trichotoma* and *M. laxa* BLUME. It is remarkable that the materials of these form, distinguished by means of the 5-merous flowers only, and from distant localities, are so uniformous as to the characters of twigs and leaves, but so different as to the dimensions of the fruit.

M. korthalsiana var. *macrophylla* WANGERIN (1907) is, as HALLIER already remarked, not 5-merous but 4-merous, and nothing but a large leaved form of *M. clarkeana,* so connecting this with larger-leaved forms of *M. trichotoma.*

M. propinqua RIDLEY (1909) is intermediate between *M. clarkeana*

and *M. trichotoma*; it has the general appearance of the latter but the appressed grayish indumentum of the former.

M. premnoides (1915) is an analogous form, but somewhat more yellowish-coloured and with a more loose indumentum.

Among the materials at my disposition I moreover found forms, that as well as several of the above-mentioned ones, deserve distinction as variaties. I am quite well aware, that it is rather arbitrary how many varities may be named as such, but as on one hand I thought it undesirable to let forms as *M. Maingayi*, *M. acuminatissima* and my new variety *simalurana*, unnamed, and on the other hand the distinction of varieties is a means by which the polymorphy of a species may be more distinctly expressed, I have described, in the following, as many as 9 varieties. Besides these, there remain several, more or less intermediate, forms unnamed.

Of the varieties described, the var. *laxa* may be considered as the central type, from which the other varieties diverge in different directions. It is connected by the var. *benculuana* with the extreme var. *simalurana*; in this direction the variability is characterized by the increasing dimensions of all vegetative parts, and of the indumentum, which, however, is shorter and more papillose than that of the var. *Maingayi*. The var. *laxa* is connected with the extreme var. *Maingayi* by such forms as indicated in the distribution list as *sub-Maingayi*, and among which is *M. Maingayi* var. *sub-tomentosa* KING. The var. *Maingayi* is characterized by more copious velvety indumentum and thicker leaves with stronger nerves impressed on the upper surface. To the connecting forms the var. *benculuana* is rather similar. By forms indicated by the name *sub-clarkeana* and *clarkeana* the central type *laxa* is connected with the extreme var.s *acuminatissima* and *tenuis*. It this series of varieties the dimension of vegetative parts are decreasing, the twigs become very slender, the leaves thin and small, the indumentum gray and appressed. The var.s *korthalsiana* and *rhynchocarpa* are no extreme forms; from the var. *laxa* they are distinguished each by one striking character, the former by 5-merous flowers, the latter by peculiarly rostrate fruit.

The varieties distinguished here are the following:

1. Var. **tenuis** nova var.; arbor ad 25 m alta, altitudine 1.5 m 40 cm diametro; internodia foliifera parte inferiore 1—3 mm crassa; petiolus 5—16 mm longus; lamina 4—9 cm longa, 2—4 cm lata, ovata vel elliptica vel nonnihil oblongior, acumine distincto vel conspicuo, 5—12 mm longo, 3—4 mm lato, obtuso, non spathulato, tenuiter coriacea vel chartacea. Corymbi minores vel parvi, sub triadibus ter vel quater

trichotomi; bracteae inferiores nonnunquam foliaceae, plerumque petiolaceae acutae ad 4 mm longae, superiores minores triangulares acutae, tempore fructificationis maxima parte deciduae; flores 4-meres; fructus (maximi noti) 14—15 mm longi, 6—7 mm diametro, ovati, calycem versus paulum acutae; indumentum canum adpressum, ad inflorescentias ramulos petiolos nervosque crassiores juveniles restrictum, denique in omnibus partibus deciduum.

Distribution: Sumatra, Borneo.

2. Var. **acuminatissima** nov. var.; arbor magnitudine ignota; internodia foliifera parte inferiore 1.5—2 mm crassa; petiolus 10—15 mm longus; lamina 7—12 cm longa, 2—3.5 cm lata, lanceolata vel ovato-lanceolata, tenuiter coriacea vel chartacea acumine 12—20 mm longo apicem versus sensim attenuato acuto vel acutiusculo; corymbi sub triadibus ter trichotomi; bracteae non foliaceae, omnes parvae triangulares acutae, mox deciduae; flos statu alabastri adulti 3—3.5 mm longus, 4-meres; fructus ignotus; indumentum adpressum canum, in inflorescentiis floribus petiolis internodiisque iuvenilibus, iam tempore florendi parte deciduum.

Mastixia acuminatissima BLUME, Mus. Bot. Lugd. Bat., 1, p. 258 (1850).

Distribution: Sumatra.

3. Var. **clarkeana** nov. var.; arbor (ex singula schedula) ad 37 m alta, trunco altitudine pectoris ad 76 cm diametro; internodia foliifera parte inferiore 1—3 mm crassa; petiolus 6—20 mm longus; lamina 7—17 cm longa, 1.5—8 cm lata, ovato-oblonga ad lanceolata, chartacea vel tenuiter coriacea, acumine distincto apicem versus sensim attenuato, 5—15 mm longo 2—4 mm lato, plerumque obtuso raro subspathulato; corymbi sub triadibus quater vel quinquies trichotomi; bracteae inferiores magis vel minus foliaceae saepe folia normalia parva, abrupte in superiores parvas acute triangulas plerumque iam tempore florendi deciduas transientes; flos statu alabastri adulti 2—3 mm longus, 4-meres; fructus quoad notus (ex speciminibus non typicis) ovato-oblongus vel angustior, ad 30 mm longus 10 mm diametro; indumentum canum adpressum in inflorescentiis, floribus, petiolis, foliorumque nervis crassioribus, mox deciduum, iam tempore florendi in extremitatibus inflorescentiarum tantum permanens.

Mastixia clarkeana KING, Journ. As. Soc. Beng., 71, 2, p. 75 (1902) an cum var. *macrophylla*?

Distribution: northern parts of the area of the species, Sumatra, Bangka, Malay Peninsula, North Borneo.

Specimens indicated by me in the distribution lists as *sub-clarkeana* are those forms, that belong to *clarkeana* as to the indumentum, but that have coarser twigs and larger leaves, or that verge towards the var. *laxa* by looser indumentum on the nodes and more brownish hue of the twigs and undersides of the leaves; among these is the form described by RIDLEY as *M. propinqua.*

4. Var. **laxa** MIQUEL; arbor ad 28—30 m alta, trunco pectoris altitudine 40 cm diametro; internodia foliifera parte inferiore 2—7 mm crassa; petiolus 8—24 mm longus; lamina 4—20 cm longa, 2—8 cm lata, tenuiter coriacea, elliptica vel ovata ad oblonga vel ovato-oblonga, acumine valde variabili, brevi vel longo, obtuso vel acuto, nunquam tamen spathulato; corymbi sub triadibus quater vel quinquies trichotomi; bracteae non foliaceae, omnes parvae acutae triangulares, inferiores iam ante tempus florendi deciduae; flos statu alabastri adulti 3—3.5 mm longus, 4-meres; fructus 20—30 mm longus, 9—13 mm diametro, ovatus; indumentum fuscum vel ochraceum, saepe floccosum in omnibus partibus iuvenilibus, tempore florendi in floribus et extremitatibus inflorescentiarum, in petiolis et in facie inferiore nervorum crassiorum. raro etiam parcum in laminae facie inferiore.

Mastixia trichotoma BLUME, Bijdr., 13, p. 655 (1825); *M. trichotoma* & *M. laxa* cum var. *angustifolia* BLUME, Mus. Bot. Lugd. Bat., 1, p. 257, ic. 58 (1850); *M. trichotoma* MIQ., Fl. Ind. Bat., I, 1, p. 772 (1856) & p. 1095 (1858) cum var. *laxa*.

Distribution: Java.

5. Var. **korthalsiana** nov. var.; arbor 12—25 m alta, trunco altitudine pectoris 10—60 cm diametro; internodia foliifera parte inferiore 1—5 mm crassa; petiolus 10—17 mm longus; lamina 5—16 cm longa, 2—5.5 cm lata, chartacea vel tenuiter coriacea, elliptica ad oblongolanceolata, raro paulum ovata, acumine valde protracto 5—20 mm longo 2.5—5 mm lato obtuso sed nunquam spathulato; corymbi statu fructifero tantum noti, sub triadibus quater vel quinquies trichotomi, bracteis ignotis tempore fructificationis iam deciduis; flos 5-meres; fructus oblongo-ovatus, 20—32 mm longus 8—14 mm dametro; indumentum fuscum floccosum in omnibus partibus iuvenilibus, postea in nodis ramulorum et inflorescentiarum tantum permanens.

M. Korthalsiana var. *typica* WANGERIN, in FEDDE, Repert., 4, p. 335 (1907).

Distribution: South-Sumatra, South-Borneo.

6. Var. **Maingayi** nov. var.; arbor 20—40 m alta, trunco altitudine pectoris c. 40 cm diametro; internodia foliifera 2—5 mm crassa; petiolus

10—20 mm longus; lamina crassiuscule coriacea, nervis lateralibus primariis et secundariis facie superiore impressis, 10—20 cm longa, 4—9 cm lata, ovata ad ovato-oblonga, rarius elliptica ad lanceolata vel angustior, acumine plerumque ad 10 rarius ad 20 mm longo obtuso, nunquam tamen spathulato; corymbi sub triadibus quinquies vel sexies trichotomi; bracteae inferiores plerumque foliis normalibus similes vel magis minusve foliaceae, superiores vario modo diminutae, ad tempus fructificationis permanentes; flos 4-meres, statu alabastri adulti 2.5—3.5 mm longus; fructus ovatus, 18—20 mm longus, 10—13 mm diametro; indumentum dense velutinum in omnibus partibus iuvenilibus, in inflorescentiis adultis ramulis petiolis faciebusque inferioribus foliorum tantum permanens.

Mastixia Maingayi CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 746 (1879).

Distribution: around the Malacca and Karimata Straits, i.e. southern and western coast of the Malay Peninsula, eastern coast of Sumatra, Bangka, western coast of Borneo.

7. Var. **benculuana** nov. var.; arbor 21—28 m alta, trunco ad 45 cm diametro; internodia foliifera parte inferiore 3—5 mm crassa; petiolus 17—35 mm longus; lamina 10—20 cm longa 4—8 cm lata, crassiuscule coriacea, nervis lateralibus primariis tantum impressis, ovato-oblonga, rarius elliptica vel oblonga, acumine 7—12 mm longo obtusiusculo vel acutiusculo; corymbi sub triadibus quater vel quinquies trichotomi, bracteis omnibus parvis, inferioribus iam ante anthesin deciduis; flos 4-meres, statu adulto ignotus; fructus 25—30 mm longus, 14—16 mm diametro; indumentum papillosum vel nonnihil velutinum, fuscum, diu permanens etiam in ramulis, in petiolis nervis crassioribus et inter nervos facie inferiore, denique iam parcissimum iam densiusculum.

Distribution: Korinchi Peak and Bencoolen.

8. Var. **rhynchocarpa** nov. var.; arbor 20—25 m alta, trunco 25—40 cm diametro; internodia foliifera parte inferiore 2—4 mm crassa; petiolus 10—18 mm longus; lamina tenuiter coriacea, 9—16 cm longa, 3—7 cm lata, elliptica ad oblonga vel nonnihil ovata, acumine protracto 8—16 mm longo acuto vel obtuso, non spathulato; corymbi sub triadibus c. quater trichotomi; bracteae omnes parvae acutae, inferiores 2—5 mm longae superiores gradatim decrescentes; flos 4-meres, statu adulto ignotus; fructus immaturus tantum notus, disco inflato 4-tuberculato et stylo in rostrum 2—3 mm longum aucto coronatus; indumentum fuscum papillosum vel saltem breve, in omnibus partibus iuvenilibus densum, mox tenuescens, in foliorum facie inferiore denique deciduum.

If the beak on the fruit might prove to be a deformity, this variety would hardly differ from the var. *benculuana*.

Distribution: Central Borneo.

9. Var. **simalurana** nov. var.; arbor 18—21 m alta, trunco c. 16 m alto, pectoris altitudine 50—150 cm diametro (sic!); internodia foliifera parte inferiore 4—10 mm crassa; petiolus ad 32 mm longus; lamina 7—25 cm longa, 3—12 cm lata, crassiuscule coriacea, ovato-oblonga, acumine 5—20 mm longo obtiusiusculo; corymbi in paniculas uniti, sub triadibus sexies vel pluries trichotomi; bracteae omnes parvae triangulae acutae vel inferiores folia normalia; flos 4-meres, adultus 2.5—3 mm longus; fructus 20—35 mm longus, 10—15 mm diametro; indumentum fuscum breve adpressum vel papillosum, in omnibus partibus iuvenilibus densum, mox tenuescens, in ramulis diu permanens, in petiolis et in foliorum nervis crassioribus et etiam inter nervos facie inferiore breve sed subdensum.

Distribution: Island Simeuloeë (Simaloer).

In the following distribution list of the species I have indicated the varieties by bold-faced capitals, being the initial ones of the variety names. So **A** = var. *acuminatissima*, **B** = var. *benculuana*, **C** = var. *clarkeana*, **K** = var. *korthalsiana*, **L** = var. *laxa*, **M** = var. *Maingayi*, **R** = var. *rhynchocarpa*, **S** = var. *simalurana*, **T** = var. *tenuis*.

MALAY PENINSULA. Without exact locality: MAINGAY, Kew distribution 711 (Be, L) **M**; Penang: Government Hill, 360 m, CURTIS 1564 (S) **M**; Perak: SCORTECHINI 98 (Be) **C**; 625b (B, S) **C**; 869 (L) **C**; the Cottage, CURTIS 3575 leg. FOX (S), v.n. *kayu neiri* **L**; Pahang: Telom, RIDLEY 13899 (S), type *M. propinqua* RIDL. **sub-C**; Selangor: Sungei Lalang Kajang, SYMINGTON 22615 (S) **C**; Malacca: Sungei Udang, 0 m, DERRY 584 (S) v.n. *kayu mawa* & 1036 (S) v.n. *kayu bengkal bukit*, **sub-M**; Singapore: CANTLEY's collector s.n. (S) **M** & ?.

SIMEULOEË. ACHMAD 109 (B, L), v.n. *ahelat*, 500 (B, L, U) v.n. *awa simangoerah*, 510 (B, L, U) *awa ahelat oeding*, 588 (B, L, U) v.n. *awa enti*, 696 (B, L) v.n. *ahelat oeding*, 1183 (B, L) v.n. *toetoen simangoerah pajo*, all **S**.

SUMATRA. Without exact locality: PRAETORIUS (L, U), authentic specimens of *M. acuminatissima* BLUME, **A**; Oostkust: Karolanden near Kp. Tongka, 1456 m, boschpr. bb. 6234 (B), v.n. *damar* ?; Westkust: G. Singgalang, BECCARI P. S. 46 (L) var. ?; Pajakoemboeh, Kp. Oeloe Air, 1240 m, boschpr. bb. 6710 (B), v.n. *kiauw*, **T**; Oud-Agam, Kp. Paoeh, 1300 m, boschpr. bb. 2932 (B, L) v.n. *madang toendjoek*, **C**; Oud-Agam, S. Dareh near Kp. Batas Tjoeli. 1200 m, boschpr. S.W.K. II. 27 (B), v.n. *madang toendjoek*, var. ?; Oud-Agam, Kp. Mabalak, 1000 m, boschpr. bb. 6666 (B), v.n. *djao* **M**-?; Solok, near Kp. Loeboekselasih, 1000 m, boschpr. 5499 (B, L) v.n. *koendoer (djanten)*, var. ?; G. Kerintji, 2000 m,

BÜNNEMEYER 9572 (B, S), **B**; Bengkoeloe: Redjang, Bt. Kaba, boschpr. bb. 2254 (B, L), v.n. *boeng*, **B**, & bb. 2255 (B, L) v.n. *tanah*, **B**; Redjang, Rimba Air Tidatar, boschpr. bb. 2446 (B, L) v.n. *medang tima*, **B**; Redjang, Taba Penandjoeng, boschpr. bb. 2286 (B, L) v.n. *medang djentik*, var.?; Kroë, Kota Banglai, 900 m, boschpr. bb. 10297 (B) v.n. *kembang tjangké*, var. ?; Palembang: Kp. Ning, R. Bliti, 150 m, H. O. FORBES 2744 (Be, L, S) **K**; Lematang Oeloe, 150 m, LAMBACH 1261 (B, L) v.n. *medang kladi*, **K**; Pasemah-landen, Pg. Tjawang Tjempedak, marga Lb. Boentak, 1200 m, boschpr. T. B. 208 (B) v.n. *kemoeran*, **T**; Lematang Ilir, 75 m, boschpr. 98 T. 3 P. 261 (B, L), v.n. *kapoer*, **M**.

BANGKA. Pangkal Pinang, TEYSMANN (B), **C**; Muntok, Air Limau, boschpr. bb. 7826 (B) v.n. *mentepong*, **M**; Rindik, 10 m, boschpr. bb. 11578 (B) v.n. *menamer*, **M**.

BELITOENG. Tandjoeng Pandan, near Kp. Bantan, 30 m, boschpr. bb. 9171 & 10237 (B), v.n. *mendamaran*, var. ?.

BORNEO. Sarawak: native collector 1856 (L) **C**; Kuching, GARAI (HAVILAND) 957 (S, Sa) **C**; Kuching, HAVILAND & HOSE 3625 E (L) **C**; West Borneo: Kapoeas, TEYSMANN 8379 H. B. (B) v.n. *imoer-imoer*, **M**; G. Kenepai, HALLIER B 1836 (B, L), **T**; East Borneo: Boeloengan, Selimbatoe, near Kp. Roehmah, 100 m, boschpr. bb. 11287 (B), v.n. *oeras-oeras goenoeng*, var. ?; near Long Petah, 450 m, ENDERT 3429 & 3465 (B), **K**; near Long Hoet, 150 m, ENDERT 4769 & 2572 (B) **R**; South Borneo: without exact locality, KORTHALS (B, L), in (L) authentic specimens of *M. korthalsiana* var. *typica* WANG., **K**. & of var. *macrophylla* WANG., **sub-C**; G. Sakoembang & G. Balaran, KORTHALS (L), authentic specimens of *M. Korthalsiana* var. *typica* WANG., **K**; lower Dajak-River, Kp. Teroesan, 1 m, boschpr. bb. 9888 (B), v.n. *kamoeran*, var. ?.

JAVA. Without exact locality. REINWARDT (B, L, U), authentic specimens of *M. kimanilla* BLUME, v.n. *kimanilla*, **C—L**; REINWARDT, houtsoort no. 125 (L) v.n. *plaglar minjak*, var. ?; BLUME (Be, L, U), authentic specimens of *M. trichotoma* BLUME, **L**; BLUME (B, Be, L), authentic specimens of *M. laxa* BL., **L**; BLUME, "*Mastixia trichotoma, stirps junior*" (L), var. ?; "Harriang", VAN HASSELT (L, U), v.n. *tenggau*, var. ?; Banten: VAN HASSELT (L), authentics of *M. caesia* BLUME, **C—L**; G. Poeloesari (near Pandeglang) (B, L), authentics of *M. laxa* var. *angustifolia* BL., **L**; G. Poeloesari, above Doekoeh Tjihoedjan, KOORDERS 913β, forest number *9 (B), var. ?; G. Poeloesari, 1050 m (?) (KOORDERS 914β, forest number *8 (B, Be, L, U), **L**; Dèpok, 95 m, BURCK & DE MONCHY (B), var. ?; Tjiampèa near Buitenzorg, 200—300 m, KOORDERS 30598β, forest number 486* (B, L), var. ?; KOORDERS 30597β, forest number 1548*

(B), **L**; G. Salak, BLUME (L), authentics of *M. laxa* and of *M. trichotoma* BL., v.n. *kibunting*, **L**; G. Salak, near Kp. Bodjong, 600—1000 m, KOORDERS 24478β, forest number 930* (B), v.n. *kendoe*, **L**; near Kp. Bobodjong, 800 m, KOORDERS 24459β, forest number 158* (B, L), **L**; G. Gedé, 600—1200 m, JUNGHUHN (L), var.?; G. Gedé, REINWARDT?, houtsoort no. 47, v.n. *kidedak*, var. ?, 227, v.n. *kibenteli*, var. ?; 652, v.n. *kilangseb lalakina*, var. ?; Tjibodas, tree no. 3100a, KOORDERS 32188β (B), 41829β (B), 13231β (B, L), v.n. *kibonteng*, var. ?; tree 3168a, KOORDERS 25909β (B, L), 2200β (B), 12487β (B, L), 41874β (B), 25860β (B, L), 2191β (B, L), v.n. *mehmal, memah, hoeroe mehmal*, **L**; SAPIIN 2599 (B) **L**; Takokak, G. Aseupan, KOORDERS 25680β (B), v.n. *kimenjan*, var. ?; Takokak, KOORDERS 15227β, forest number 2412a (B, Be, L) v.n. *kitendjo*, var. ?; Tjidatoe near Soekaboemi, 900 m, KALSHOVEN VII (B, L), v.n. *djerèt*, **L**; Bodjong Genteng, near Tjisalak, 500 m, KOORDERS 39459β, forest number 45* (B, L), **sub-C**; G. Bèsèr, south of Tjibeber, 1000 m, WINCKEL 264β (B, L), v.n. *hoeroe hiris*, **L**, 289β (B, L, S, U) v.n. *hoeroe minjak*, **L**; G. Boerangrang, BLUME (B), authentic of *M. laxa* BL., **L**; G. Papandajan, KORTHALS (L), **L**; Pasir Djamboe, Tjigenteng, 1400—1700 m, KOORDERS 26248β, forest number 321* (B, Be, L), v.n. *kiloengloem*, **L**; G. Tjigoeloedoeg, near Bandoeng, 1050 m, boschpr. Ja. 1368 (B), v.n. *kiloemloem*, var. ?; Pengalengan, 1200 m, JUNGHUHN (L), var. ?; Noesagedé, in the Pendjaloe Lake, 720 m, KOORDERS 47885β, forest number 341 (B), youth form with partly spread leaves, var. ?; 47886β, forest number 530 (B), very young form with spread, dentate leaves, var. ?; G. Slamet, KOORDERS 9980β, forest number 23 (B), var. ?; G. Slamet, DEN BERGER 122 (B, L), v.n. *woeroe*, **sub-C**; forest Mantrem near Ngasinan (Magelang), KOORDERS 27699β, forest number 879* (B, L), v.n. *woeroe sonten*, L; G. Oengaran, Medini, 900—1200 m, JUNGHUHN (L), v.n. *lawean*, "Plantae Junghuhnianae ineditae" 86, *Elateriospermum Tokbraj* KOORD., non BL., var. ?; Pasoeroean, G. Kidoel, forest Soembertangkil, 400—500 m, KOORDERS 23754β, forest number 1252* (B, L), var. ?; Ragadjampi (Besoeki), KOORDERS 28894β, forest number 1356* (B, Be, L), **L**.

SELEBES. Menado, near Kp. Klabat, 340 m, boschpr. bb. 14153 (B), **sub-C**; foot of G. Klabat, 600 m, KOORDERS 16977β, forest number 717 (B), v.n. *makolimboen*, var. ?; near Loeboe, KOORDERS 17519β, forest number 2226 (B), v.n. *aloechéra*, & 17518β, forest number 2257 (B), v.n. *kajoe tondongan*, var. ?; forest Loelomboelan near Pakoe-oeré, 700 m, KOORDERS 17474β, forest number 3308 (B), v.n. *sansalan*, var. ?; Kp. Klabat, 340 m, boschpr. 14155 (B), var. ?.

AMBON. Doesoen Poeta, Kp. Hatoe, 300 m, boschpr. bb. 14267 (B), v.n. *mameleng hoetan*, **sub-C**.

PHILIPPINE ISLANDS. Mindanao: Davao, Todaya, ELMER 11644 (B), cotype of *Vitex premnoides* ELM., **sub-C**; Lake Lanao, Camp Keithley, CLEMENS s.n. (Be), var. ?.

Species dubia.

Mastixia gracilis KING, Journ. As. Soc. Beng., 71, 2, p. 73, 74 (1902); WANGERIN, in ENGL., Pflanzenr., IV, 229, p. 21, 28 (1910); RIDLEY, Fl. Mal. Pen., 1, p. 891 (1922).

"A small tree; young branches slender, angled, smooth, yellowish. *Leaves* thinly coriaceous, lanceolate, tapering much to the base and still more to the much acuminate apex; both surfaces pale olivaceous-green when dry, glabrous; the upper shining, the lower somewhat dull; main-nerves 8 to 14 pairs, ascending, very little curved, faint on both surfaces; length 2.25 to 4.5 in.; breadth .8 to 1.5 in.; petioles varying from .2 to .25 in. *Cymes* in threes, terminal, about a third or a fourth the length of the leaves, on short angled peduncles, the branches short and crowded at their apices, many flowered, with a whorl of minute broad bracts at the base of flower pedicels. *Flowers* about .1 in. long, their pedicels about as long, ovoid *Calyx* campanulate; the tube puberulous, slightly furrowed; the mouth wavy, indistinctly 5-toothed. *Petals* 5, oblong-ovate, adherent by their edges, concave, leathery. *Stamens* 5; *anthers* oblong, bifid: filaments short. *Disc* small. *Style* short, conical: stigma concave. *Fruit* unknown."

"PERAK: at an elevation of about 5,000 feet; *Wray* 1528."

It seems to be unknown where the type specimen of this plant actually is. Neither WANGERIN nor RIDLEY did see it. The description does not convince me, that it really is a *Mastixia*.

Species reiciendae.

Mastixia ? cuneata BLUME, Mus. bot. lugd. bat., 1, p. 257 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 773 (1856) & 1905 (1858); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KOORD. & VAL., Bijdr. booms. Java, 5, p. 87 (1900); WANGERIN, in ENGL., Pflanzenr., IV, 229, p. 29 (1910).

According to KOORDERS & VALETON, *l.c.*, this is no *Mastixia* and probably no *Cornacea*. According to WANGERIN *l.c.* it is a species excludenda, "ex anatomia foliorum *Embelia* spec." According to HALLIER, in Beih. Bot. Centralbl., 34, 2, p. 42 (1916) it is **Notaphoebe umbelliflora** BLUME.

Mastixia ? heterophylla BLUME, Mus. bot. lugd. bat., 1, p. 257 (1850); MIQ., Fl. Ind. Bat., I, 1, p. 773 (1856); suppl. Sum., p. 136 (1860); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); WANGERIN, in ENGL., Pflanzenr., IV., 229, p. 28 (1910); HALLIER, Meded. Rijks Herb. Leiden, 36, p. 5 (1918).

According to WANGERIN *l.c.* this is a "species valde dubia". According to HALLIER *l.c.* it is **Gomphandra capitulata** BECC.

MASTIXIODENDRON.

MELCHIOR, in ENGL., Jahrb., 60, p. 167 (1925).

Only species:

Mastixiodendron pachyclados (K. SCHUM.) MELCH.; *Fagraea pachyclados* K. SCHUM., in SCHUM. & LAUTERB., Nachtr. Fl. deutsch. Schutzgeb. Südsee, p. 349 (1905); *Mastixiodendron pachyclados* MELCHIOR, in ENGL., Jahrb., 60, p. 168, t. 1 (1925); LAUTERB., in ENGL., Jahrb., 63, p. 467 (1930); C. T. WHITE, Journ. Arnold Arbor., 10, p. 257 (1929).

As to the treatment of this genus by MELCHIOR *l. c.* I can add hardly anything of importance, I will confine myself to some remarks, the more as I am in doubt, whether *Mastixiodendron* really has to be placed among the *Cornaceae*. More probable seems to me, that it might be a Rubiaceous genus, and this because of the following considerations.

The supposition that *Mastixiodendron* might be a *Rubiacea,* was awaked in me by the general appearance of the plant, and in the first place by the occurrence of large interpetiolary stipules. When we ask ourselves, why MELCHIOR does not place *Mastixiodendron* among the *Rubiaceae,* we must come to the conclusion, that this is only because of the choripetalous corolla. Therefore I have tried to settle, whether the corolla of *Mastixiodendron* really is choripetalous, but I found, that of all materials in the Berlin Herbarium the corollas were too little developed, to establish this with certainty. From the drawings given by MELCHIOR, appears, that nor the author of the genus himself saw better-developed corollas.

When we try to determine the plant with THONNER's determination key and with ENGLER & PRANTL's Pflanzenfamilien, supposing that the corolla is sympetalous, we do not only come to the *Rubiaceae*, but even without difficulty to the genus *Plectronia*, of which there occur many species in New Guinea. In the treatment of the New Guinea species of this genus by VALETON in ENGLER's Jahrbücher (61, p. 53), I did not succeed, however, in finding a species strongly resembling *Mastixiodendron.*

Anyhow, it seems to me that more attention has to be paid to the peculiar characters of the stipules of this genus. MELCHIOR mentions them, but does not describe them as interpetiolary, nor does he mention the remarkable scars they leave on the twigs nor their contort aestivation. Besides in some genera of *Rubiaceae (e.g. Sarcocephalus, Anthocephalus)*, the latter characteristic occurs in few *Rhizophoraceae (e.g. Carallia, Rhizophora, Bruguiera, Gynotroches)*, but the structure of the flower of *Mastixiodendron* makes it impossible that this genus might belong to the latter family.

Index of collectors numbers of Mastixia.

indicating the species by means of their number (1 = *M. pentandra*, 2 = *M. parvifolia*, 3 = *M. kaniensis*, 4 = *M. rostrata*, 5 = *M. bracteata*, 6 = *M. cuspidata*, 7 = *M. Scortechinii*, 8 = *M. tetrandra*, 9 = *M. trichotoma*).

ACHMAD 109 : 9; 500 : 9 510 : 9; 588 : 9; 696 : 9; 1183 : 9.
AMDJAH 55 : 6.
BECCARI P. B. 1559 : 5; P. S. 46 : 9; P. S. 956 : 4.
BLUME s. n.: 1, 4 & 9.
BOSCHPROEFSTATION.
BB-NUMBERS: 2254 : 9; 2255 : 9; 2286 : 9; 2446 : 9; 2932 : 9; 3988 : 4; 5229 : 8; 5499 : 9; 6234 : 9; 6666 : 9; 6710 : 9; 7415 : 9; 7826 : 9; 8922 : 4; 8925 : 4; 9171 : 9; 9888 : 9; 10028 : 1; 10237 : 9; 10297 : 9; 11064 : 5; 11177 : 1; 11180 : 1; 11287 : 9; 11578 : 9; 11581 : 1; 11638 : 5; 11963 : 5; 12609 : 4; 14153 : 9; 14155 : 9; 14267 : 9; E. 1053 : 1; TB. 208 : 9; TB. 1085 : 1; 158E.1P.850 : 1 & 8;
OTHER NUMBERS: 68T.1P.124 : 5; 98T.3P.261 : 9; Ja.1368 : 9; S.W.K.II.27 : 9.
BÜNNEMEYER 9572 : 9.
BURCK & DE MONCHY s. n.: 9.
BUREAU OF SCIENCE, MANILA 38841 : 3.
BURKILL & HOLTTUM 7840 : 1.
CANTLEY'S COLLECTOR s. n.: 9.
CLEMENS s. n.: 2 & 9.
CURTIS 919 : 1; 1564 : 9; 3575 : 9.
DELI-PROEFSTATION 1380 : 4.
DEN BERGER 122 : 9.
DERRY 584 : 9; 1036 : 9.
ELMER 11644 : 9; 21584 : 4; 21870 : 4.
ENDERT 2572 : 9; 2577 : 4; 3310 : 1; 3465 : 9; 4317 : 4; 3429 : 9; 4769 : 9.
FORBES 2744 : 9.
GARAI (HAVILAND) 957 : 9.
GRASHOFF 895 : 1.

HALLIER B. 569 : 2; B. 1836 : 9.
HANIFF 3759 : 1.
HAVILAND 957 : 9; 3020 : 9.
HAVILAND & HOSE 3625E : 9.
HOLMBERG 840 : 5.
HORTUS BOGORIENSIS III. G. 56 : 6; III. G. 56a : 8.
HOUTSOORTEN VAN DEN GEDEH 47 : 9; 125 : 9; 227 : 9; 645 : 4; 652 : 9.
JUNGHUHN s. n.: 4 & 9; 168 : 4.
KALSHOVEN VII : 9.
KING'S COLLECTOR 6830 : 5.
KJELLBERG 1085 : 2.
KOORDERS:

TREE NUMBERS in Tjibodas 3100a : 9; 3168a : 9.

FOREST NUMBERS (usually preceded or followed by an asterisk) 8 : 9; 9 : 9; 23 : 9; 24 : 4; 45 : 9; 157 : 4; 158 : 9; 305 : 1; 321 : 9; 323 : 4; 341 : 9; 486 : 9; 530 : 9; 717 : 9; 879 : 9; 930 : 9; 932 : 4; 1252 : 9; 1356 : 9; 1547 : 1; 1548 : 9; 1558 : 4; 2090(a) : 4; 2138a : 4; 2257 : 9; 2309a : 4; 2412a : 9; 3308 : 9.

β-NUMBERS 913 : 9; 914 : 9; 915 : 4; 2191 : 9; 2200 : 9; 9885 : 4; 9901 : 4; 9978 : 9; 9980 : 9; 11915 : 4; 11916 : 4; 11917 : 4; 12487 : 9; 13231 : 9; 14081 : 4; 15227 : 9; 16977 : 9; 17474 : 9; 17518 : 9; 17519 : 9; 23754 : 9; 23785 : 1; 23801 : 1; 24218 : 4; 24459 : 9; 24478 : 9; 25556 : 4; 25634 : 4; 25680 : 9; 25755 : 4; 25860 : 9; 25909 : 9; 26248 : 9; 26319 : 4; 27699 : 9; 28894 : 9; 30123 : 4; 30597 : 9; 30598 : 9; 32188 : 9; 32681 : 4; 32860 : 4; 33268 : 4; 37260 : 4; 88076 : 4; 39016 : 4; 39459 : 9; 41829 : 9; 41874 : 9; 47885 : 9; 47886 : 9.

KORTHALS s. n. : 6 & 9.
LAMBACH 1261 : 9.
LEDERMANN 9575 : 1.
LÖRZING & JOCHEMS 7504 : 4.
MAINGAY 709 : 4; 710 : 5; 711 : 9.
NATIVE COLLECTOR 41 : 4; 193 : 4; 1856 : 9.
NUR 11291 : 1.
PLANTAE JUNGHUHNIANAE INEDITAE 86 : 9.
PRAETORIUS s. n. : 9.
REINWARDT s. n. : 4 & 9.
RICHARDS 1966 : 5.
RIDLEY 13899 : 9.
SAPIIN 2599 : 9.
SCHLECHTER 17016 : 3; 17703 : 3.
SOORTECHINI 98 : 9; 625b : 9; 869 : 9; 1971 : 7.
SYMINGTON 22615 : 9.
TEYSMANN s. n. : 9; 8379 H. B. : 9.
THWAITES 2441 : 8.
VAN HASSELT s. n. : 1 & 9.
WINCKEL 264β : 9; 289β : 9.
WRAY 1528: *M. gracilis.*

Index of native names occurring on the herbarium labels

with reference to the species as in the preceding index.

Index to scientific names.

ON THE SPECIES CONCEPTION IN RELATION TO TAXONOMY AND GENETICS

by

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A phylogenetic system resulting from comparative morphological studies claims to be the expression of evolution. The character of any phylogenetic classification based on morphological studies exclusively is a speculative one. The fragmental facts procured by fossil relicts from earlier geological periods are also morphological and allow only the conclusion that evolution took place, but in which way changes evolved has not been stated by immediate observation.

Nobody escapes from the idea that all living beings existing yet, have originated from those in the past. It is undeniable that the vegetation which covered the earth in former periods has been changed. This historical process seen as a continuity possible by the power of reproduction of the organisms is called evolution. The idea of evolution which as a consequence of Darwinian views penetrated into taxomony is cause of the fact that species, families, ordines, phyla were considered to be more than categoric divisions; they should represent relationships or lines of descent. Taxomony got a fundamental frame: phylogeny!

The idea that higher organised (more complicated) beings should have risen from the lower organised (simple, or seemingly simple) ones is so plausible to human mind that a theory sufficiently adapted to this idea would be accepted natural and evident. In phylogeny the principle of evolution from lower to higher organisation is brought to expression. Plants and animals surrounding us, as seen from a phylogenetic point of view, form the youngest shoots of a branching system but about the very branching our knowledge is the least. Not of a single genus, not even of a single species we know the direct descent from a genus or a species in a former period. On the other hand we believe in seeing main lines of development in phylogeny, but as soon as we try to reconstruct details we are driven from facts into hypothesis. Phylogeny therefore is and can not be more than a speculative science. Aiming to fix the results of evolution, relationship by means of descent can be

made plausible or perhaps even probable, but nothing of this kind can be proved.

In all theories of evolution a common tendency can be observed. They all intend to explain the origin of species. Lamarckism, Darwinism, Mutation- and Hybridizationtheories are as many trials to reveal the origin of the taxonomic units, the species. The two first mentioned theories are built upon philosophical bases, the latter two arose in a period in which genetics began to foot on solid ground.

It is evident that one's species conception must be influenced by one's point of view: the taxonomic and the genetic conception do not fully agree, the first being constructive, intending to delimite groups of organisms under considerable personal appreciation of morphological characters, the second being analytic, based on experimentally proved hereditary individual characters. The taxonomist takes a species as a morphological unit, the geneticist as a population of individuals of different constitution. With regard to the species conception the taxonomist and the geneticist are on similar terms as the author and the critic.

Till the time of LAMARCK the species conception was inviolable. It was the conviction that the species was a created unit (LINNAEUS) and that its constancy was beyond doubt. LAMARCK was the first who got insight in its variability and took from it the possibility of evolution. He meant that an individual could vary in a manner profitable for this individual. Essential to this theory is: reaction of the individual to the environment by direct adaptation; changes of the milieu could alter the type with hereditary effect. Darwinism propagated an allround variation. Only the best utilised individuals survived as a result of competition and nature itself selected the fittests. The most frequent form of a Linnean species was the type. As long as the type remained the fittest it kept the majority and constancy of the species to a certain extent was the result. Varieties were incipient species which by selection could raise to the rank of species. The title of the famous work "Origin of species by means of natural selection" shows that DARWIN understood evolution as the offspring of new species.

Characteristic to modern theories is that the points of comparison are changed under influence of genetics. Not the characters are inherited but the genes manifesting the characters during the individual development. The phenotypical appearance became of secundary importance. Though the moment of evolution still lies in the origin of species, the basis of all evolutionary consideration was the genotypical

constitution, the hereditary units, transmitted from parents to children, forming a set completely present in the nucleus (intracellular pangenesis).

DE VRIES assumes the possibility of changes in the gene sets causing mutations. Not only latent genes may become active, or genes may get lost, but also genes may be formed de novo, in the latter case giving rise to progressive mutations. This kind of mutation implies evolution but various hypothetical considerations are necessary to emphasize the evolutionary moment (premutation periods) and as progressive mutations are very rare the direct significance for evolution diminishes considerably.

LOTSY's theory of evolution by means of hybridization tries to explain the origin of species by recombination of genes made possible by the power of sexual reproduction. To LOTSY's opinion the fusion of gametes of different constitution is the primary cause of all diversity among organisms. The surviving forms in a hybrid population are not the fittest ones selected by nature but those which are eventually best adapted to the existing circumstances. Isolation is the cause of differentiation of new species. Not selection of existing forms but succession determines the changes of flora and fauna in successive periods. No complicate hypothesis underlies this theory and the only assumption induced by the theory itself is polyphyletic origin of species.

One may doubt whether hybridizing was the only way evolution took, it is a matter of fact that crossing gives rise to considerable diversity. A single cross between two species e.g. *Tragopogon pratensis*. *T. porrifolius* shows more diversity in its progeny than any other phenomenon. The greatest advance in experimental evolution are the bi- and trigeneric hybrids (*Aegilotriticum*, TSCHERMACK; *Raphanobrassica*, KARPECHENKO).

The importance of hybridization as a cause of the origin of species cannot be better evidenced than by BAUR's latest publication (1932, p. 289). From experimental researches on species of *Antirrhinum* (sect. *Antirrhinastrum*) BAUR formerly explained the origin of new forms by mutation. On account of his investigations concerning forms occurring in Spain, however, he now declares (l. c.) that it is possible to explain the total abundance of diverse forms from the crossing of a few orginally present forms. He declares that he is able to reproduce all types of *Antirrhinum* that now can be found in Spain, Italy and North Africa by means of material consisting of only one form from each of the groups ***Antirrhinum latifolium, A. majus, A. Barrelieri, A. ramosissimum, A. glutinosum, A. molle*** and ***A. Siculum***!

The phenomenon discovered by MENDEL that the hereditary units do not lose their individuality and being transmitted to a following generation are separated individually, could be used to a certain extent for phenotypic analysis (dominance and recessiveness). Mendelism got a powerfull support by MORGAN's interpretation of the mechanism of Mendelian heredity. The crossing-over theory created the possibility to study the localisation of genes in the chromosomes. Chromosome numbers and chromosome morphology induced taxonomy on a cytological basis.

Hundreds of evidences from experimental work showed that the species could not be regarded as a unit based on genetic identity. It is evident that the morphological species conception had to undergo the criticism from genetic standpoint. The attempts to change or to enlarge the species conception with genetic, cytological and ecological elements have lead to better insight in the problem and brought the investigators on different lines to a field of mutual research; yet the needs of phylogeny could not be satisfied by mendelian or cytological data.

The best starting point for comparison of taxonomic and genetic views is the Linnean species. Undoubtedly the delimitation of species and minor groups with the use of morphological criteria can be carried to extremes which easily leads to naming single specimens in the herbaria. Units minor to the species have little taxonomical value. There characters are more influenced by environment.

Varieties must possess hereditary characters which distinguish them from the species, modifications are due to environmental effects. Inspection alone is an untrustworthy criterion *).

As a rule, however, the herbarium specialist disposes of a few specimens only and the geneticist will object that in those cases only a few of the combinations of characters possible in the species are represented. Nevertheless it is quite possible that the species of the taxonomist coincide with the genetic delimitation, as all phenotypical manifestation is due to the genetic constitution. Genetical researches are useful to expose the artificial nature of morphological classification. It is perfectly true that modern taxonomists do not regard the Linnean species as a model of a taxonomic unit. Not all species described by LINNAEUS are moreover collective ones. The collective species of LINNAEUS

*) STIEFELHAGEN (1910) p. 468, calls *Scrophularia Neesii* WIRTG. a modification of *S. alata* GILIB. Experimental investigation has proved that *S. Neesii* is a distinct form which even can be regarded as a good species (GOETHART and GODDIJN, unpublished).

are taxonomically as well as genetically groups of polymorphic organisms. The taxonomist however clings to his species conception. All minor differences revealed by genotypic analysis do not disturb his own categories. To him species are representations of ideal forms to which he ascribes specific morphological characters of real value. Be it that his species are abstractions, he will always regard them as natural groups of organisms. The individuals of a distinct group may not be alike and differ in many characters, they are all the same different from individuals of other groups. The different groups are separated definitely by morphological, ecological or even physiological divergences and a relative constancy of each group for longer periods is the justification of delimitation in categoric units such as species are. Delimitation of species taxonomically occurs undependent of any theory of evolution!

The last consequence of Mendelian segregation with regard to the species conception was drawn by LOTSY (1916). To his opinion the smallest taxonomic unit which could bear the name of species should be a group of individuals of identical constitution unable to produce more than one kind of gametes, in other words: species should be pure homozygous constitutions. Though the idea is perfectly logical, changing the meaning of the taxonomical species violates the historical development of the conception too much and moreover does not fit practical purposes. Such groups of homozygous individuals may be apt for genetic research, in taxonomy they are rather useless. This fact has been often repeated, but LOTSY's idea must not be judged from this single suggestion. Later on he never again used the term species in this sense. Totally pure homozygous constitutions, if they occur in nature, can never be proved. Even in pure lines no certainty can be obtained that the constitution as a whole is homozygous. The intention of LOTSY's terminology was to replace the term species in taxonomical sense by another one expressing its evolutionary value. The Linnean species he named L i n n e o n, consisting of minor definite groups called J o r d a n o n s (microspecies) and th term "species" than should be preserved for the smallest genetically possible units. "Species" in the publications of LOTSY must be understood as Linneons.

For cases of intercrossing Linneons with fertile crossing products, mixing up with the parent Linneons to a bigger crossing association, he proposed the term s y n g a m e o n. The syngameon embraces those polymorphic groups in which two or more Linneons (species) intermingle

and the Linneons are linked by transitional fertile hybrid individuals. This series of terms thus is testifying the evolutionary thought of the hybridization theory. They represent the species conception of a geneticist who spent a great deal of his life on taxonomy. LOTSY's terminology was meant to preserve systematic categories and in the possibilities of crossing he tried to find limits for natural groups. His definition of a "species" was rejected, but the terms Linneon and syngameon have found approbation of many authors. All the same the taxonomist will not be satisfied by this categories as the syngameons represent the most difficult things to deal with in taxonomy. When the taxonomist is able to find out the parent species in a hybrid population he does not care much for the syngameon. The greatest difficulties arise in highly polymorphic groups designated as syngameons in which the constituent species, possibly more than two, can not be easily recognized. A great trouble are those in which the transitional forms could have risen from crossings other than the likely supposed parent species; the extreme diverse forms of a syngameon need not be identical with the species which caused the origin of the syngameon. It is quite possible that within a syngameon the parent species are lost and new species are not differentiated. Determining syngameons remains a trouble as they always will require experimental investigation to prove the hybrid constitution of the constituents. In complex syngameons the possibility that other than the supposed parents have shared in the constitution of certain forms, is not excluded. Such populations will be regarded as species, or divided into subspecies, or simply taken as hybrid populations. Several hybrid populations are described by LOTSY, COCKAYNE, ALLAN, HERIBERT NILSSON, and I have only to mention the syngameons *Nothofagus Cliffortioides* × *N. fusca* (LOTSY 1925) of the New Zealand forests and *Euphorbia Bothae* P. h. and *Euphorbia anticaffra* P. h. of the Fishriver district in the Cape Province of South Africa, to point out their significance for the vegetation and the rôle they play in evolution (LOTSY and GODDIJN 1928). The *Nothofagus* forests consist for a considerable part of hybrid populations. *Euphorbia Bothae* and *Euphorbia anticaffra* are covering vast regions of the Fishriver valley and in localities of square miles even dominate the aspect of the vegetation. These two hybrid populations are linked and though they are recognized as syngameons by inspection, nothing more can be said with certainty about their presumable origin than that *Euphorbia coerulescens, E. tetragona* and *E. triangularis* have something to do with them. Only experiment

can bring further insight. The diversity in *Euphorbia Bothae* is so considerable that f.i. at Botha Hill no two specimens growing close together are alike. So it takes no wonder that several forms were described as distinct species (*E. Ledienii, E. Franckiana* a. o.); such species could be augmented ad libitum (LOTSY and GODDIJN 1928).

Less complicated syngameons as the hybrid populations of Cotyledon species are more or less localized, but nevertheless they are linked by the possession of a mutual parent. They also occur in the Eastern Cape Province e.g. *Cotyledon coruscans* × *C. teretifolia,* is connected on one side with *C. teretifolia* × *C. Beckeri* and *C. teretifolia* × *C. gracilis,* on the other side with *C. coruscans* × *C. Beckeri* and presumable also with *C. coruscans* × *C. gracilis.* Also other hybrids of Cotyledon were recognized such as *C. paniculata* × *C. Wallichii* which seemed to be an isolated hybrid population. The Cotyledons of South Africa thus demonstrate a genus in a period of evolution, separated syngameons being on their way of developing new species.

Another example of a remarkable hybrid population may be mentioned here. At Menaggio on the Lago di Como (and also at the Lago Maggiore) hybrid populations of *Primula acaulis* × *Primula officinalis* occur, showing a great diversity. Out of this population a new Linneon embracing a group of intermediate forms will probably develop. At the outskirts of the syngameon stand forms, nearing the parent species, which certainly will be regarded as members of the parent linneons. Among the segregation products occur a very few forms resembling closely *Primula elatior,* and it is not improbable that *P. elatior* should have risen from a crossing between *P. acaulis* × *P. officinalis.*

In different localities in Switzerland the hybrids *P. acaulis* × *P. elatior* (e. g. at Flüelen) and *P. elatior* × *P. officinalis* (on the Rigi at Felsenthor) occur. Where the possibility of crossing between the three species is present, a complex syngameon is formed. In such a syngameon the combination of parent characters in the separate individuals can hardly be recognized by inspection. Exploration may give the conviction that different Linneons are fused, but experimental statement must confirm the field work.

The only way to solve taxonomical difficulties with polymorphic species goes along lines of experimental research. *Scrophularia Neesii* WIRTG. and *S. Ehrharti* STEV. are closely allied species; they intercross and produce partly fertile, partly sterile progeniture. The products of crossing and backcrossing (only partly with one of the parents) are

rather undistinguishable from the parent species. The parent species themselves in their extreme forms are distinct enough, but as no definite criterion separates them they have often been counfounded. All their characters being transgredient, it is plausible that some taxonomists took them together into one and the same Linneon (*S. aquatica* L.; *S. alata* GILIB., in which probably even more species are included). Nevertheless *S. Ehrharti* and *S. Neesii* are separated physiologically, behaving themselves as distinct species when crossed with each other and their reaction being different when hybridized with a same foreign species *).

DANSER (1929) also tried to delimit the possibilities of crossing but he did not touch the taxonomic categories, intending to point out the phylogenetic origin of populations (convivium). All individuals which are hold together by possibilities of hybridization are called a c o m p a r i u m; it does not matter whether the products of hybridization are fertile or sterile. Such groups will as a rule not coincide with taxonomic categories, but are certainly of value for phylogenetic purposes. An association of individuals which are connected by possibilities of exchanging genes, i.e. which can be intermingled, DANSER calls c o m m i s c u u m (Vermischungsgenossenschaft). These groups may coincide with, or approach to a species; they are polymorphous like Linneons. C o n v i v i a, however, are populations, groups of individuals, differentiated within the commiscuum, isolated by geographical influences. Here also isolation is introduced to explain the cause of differentiation. The concepts of LOTSY and DANSER are biological ones. DANSER attempts to find delimitations in connection to plantgeography.

A convivium must be more or less distinguished from the other parts of the convivium, forming a group of close resemblance and hold together by circumstances limiting their intercrossing. A convivium may coincide with a species in certain cases, but not necessarily does. Under particular conditions subspecies or varieties may form convivia. At the best a convivium can be compared with HAAGEDOORN's species as DANSER himself discusses, a population tending to reduce its potential polymorphy. (The potential variability is given by the number of genes in respect to which a group of individuals is not homogenous. The qualitative stability of genes accepted, the potential variability in a population of limited crossing possibilities reduces automatically, according

*) An account on experimental work with Scrophularia by Dr GOETHART and the present writer is in preparation.

to HAAGEDOORN (1921). DU RIETZ (1930) accepts this even as a law). DANSER (1929) has given different examples to illustrate his concept.

It is evident that DANSER, in more refined a way than LOTSY, thought in the same line, trying to delimit groups the origin of which could be understood. The mere morphological species conception is insufficient for such a purpose. No grouping on particular line will clear up phylogenetic relationship between species and certainly not a morphological system of classification.

We have no certainty that the natural taxonomical groups are branches of a natural system. They are groups based on external resemblances, separated by gaps of discontinuity. To ascribe resemblance between groups to phylogenetic origin is a mere hypothesis (conf. LOTSY 1925).

Another refined attempt of grouping individuals was made by TURESSON (1929). He saw the species delimitation as an ecological problem. Ecological experiments have shown that species of a wide distribution, being divided over different localities (habitats) split off races of different hereditary characters. When different ecological types, definite morphologically distinguished races, are tied to different habitats by edaphic factors, belong to the same Linneon, those races are not to be regarded as a kind of species. In essential points there is no fundamental difference between TURESSON's and DANSER's concept, although the term convivium has a wider sense than ecotype. One could say the ecotype is a convivium caused by ecological influence. Four groups are discerned by TURESSON: c o e n o s p e c i e s, a population in which species group themselves on account of vitality and sterility limits, but all of common origin so far as indicated by morphological, cytological or experimental facts; a g a m o s p e c i e s, apomictic population under the same conditions; e c o s p e c i e s, an amphimict population with vital and fertile descendants but more or less sterile when crossed with constituents of any other population; the e c o t y p e is the response (genotypical) of an ecospecies to a certain habitat. GREGOR (1931) e.g. in his study on experimental delimitation of species gives a case in which the system of TURESSON has been applied. *Phleum pratense-alpinum* form a coenospecies. In *P. pratense* two groups are cytologically discerned which do not intercross, a hexaploid and a diploid one. In *P. alpinum* likewise two groups exist, a tetraploid and a diploid. These groups are considered as ecospecies. Some ecotypes of *P. pratense* could be distinguished, four of diploid and three of hexaploid constitution.

In an extensive study on the fundamental units of biological taxonomy DU RIETZ (1930) redefined the terms form, species, subspecies and variety, grouping them morphologically, laying much stress on the effect of geographic isolation and the automatic reduction of polymorphy. DU RIETZ accepts JOHANNSEN's definition of a biotype, a population consisting of individuals with identical constitution (Elemente der exakten Erblichkeitslehre). The variety is a population consisting of individuals of one or more biotypes forming a more or less distinct local facies of a species. The subspecies is a population of several biotypes forming a more or less distinct regional facies of a species, and the species he calls the smallest possible natural populations permanently separated from each other by distinct discontinuity in a series of biotypes. The importance of hybridization and isolation comes to light when he defines the species as: a population consisting either of one strictly asexual and vital biotype, or of a group of practically undistinguishable, strictly asexual and vital biotypes, or of many sexually propagating biotypes forming a syngameon separated from all others by more or less complete sexual isolation or by comparatively small transitional populations.

This concept agrees with the views of LOTSY, DANSER, HAGEDOORN, HERIBERT NILSSON and many others Criticism of DU RIETZ's views says that the apparently disregards the selective effect of environmental conditions on a genotype complex (conf. GREGOR a. o.) Anyhow DU RIETZ does not deny the possibility that mutation may play a rôle in the process, but he is convinced that the role of isolation in nature is sufficient to explain the process of differentiation. Differentiation by means of automatic reduction of polymorphy is enough to explain what we see in nature. The rôle of selection seems to him overestimated and herewith many other authors agree (conf. DU RIETZ 1930, p. 399).

One other species concept may be mentioned here, more particularly in connection with cytogenetics.

Some points may be stated as evidence from cytological work firstly concerning the basis of heredity. From cytogenetic standpoint it is not a mere assumption that the species have practically a constant number of chromosomes (genoom). A second fact of importance is the probably linear arrangement of the genes, the primary hereditary units, in the chromosomes. The chromosomes occur in pairs, in which the genes occupy identical loci. The chromosome sets consisting of n pairs, the hapliod generations have n chromosomes, and this number, though not always, being constant, proved to be in many cases a characteristic feature of related species.

Multiple series of chromosome numbers with a basic number apparently have taxonomic value. The work of CLAUSEN on Viola and of HURST, TACKHOLM, BLACKBURN and HARRISON on Rosa have become classic in this respect. CLAUSEN found that a definite series of chromosome numbers occurring in Viola species coincides with taxonomical groups; he divided the section Melanium in subgroups based on the numbers of chromosomes. Not always it will be possible to classify a genus according to this principle. Such divisions can be made when a basic number in the somatic cells is stated and degrees of polyploidy may be used to separate the different sections. The study of chromosome morphology, however, widened the prospects for systematic applications and even proved to be of more value than the numbers solely. This has been the merit of NAVASHIN and his school (LEWITSKY, DELAUNAY, TAYLOR, HOLLINGHEAD, MANN, LESLY, AVERY, ROSENBERG etc.). According to these investigators the chromosomes could be used not only for classification, but also for revealing phylogeny of species, by studying chromosome morphology (size, form, satellites, constrictions a.s.o.). This kind of study combined with phenotypical appearance of the species considerably raised the value of cytological investigation and has produced even systems of classification. A single case may be mentioned to illustrate the bearing (stretching) of such investigations. HOLLINGHEAD and BABCOCK (1930) published an interesting study on chromosomes and phylogeny in the genus Crepis. No less than 70 species were cytologically studied by different investigators. Now in Crepis apparently the similarity of chromosomes points to a common origin. The American species can be arranged in a polyploid series, some of the European species too, the others probably arose from interspecific hybridization. These species were divided into sections, one of which, Paleya with the basic number 10, could be considered as the most primitive subgenus from which the other subgenera could be derived: Barkhausia with the numbers 8, 10 and 16, Catonia with 12, and the heterogeneous Eucrepis. Paleya could be supposed to contain or to have contained the progenitors of all other subgenera. In Eucrepis the connecting forms have disappeared with Paleya. Now it is evident from the discussion that different assumptions as to the chromosome changes are made, but there remains the fact that morphological similar species have similar chromosomes and that the phylogenetic system projected by the authors for the genus Crepis undoubtedly proves the great value of this studies for taxonomy, showing the connection between chromosome number

and chromosome morphology on one side with phylogenetic relationship on the other.

Acknowledging that Mendelian heredity, except in the cases of cytoplasmatic inheritance, during more than 30 years established by numerous experiments as the basis of all heredity, consolidated by MORGAN's school with cytological data, it is plausible that cytology must be drawn into consideration at the delimitation of species. A step to a cytogenetic species definition was made by BABCOCK (1930).

BABCOCK states from existing evidence that the hypothesis of DARWIN and LOTSY are at least in part correct and that the present species must have risen through differentiation aided by isolation within preexisting species. Interspecific hybridization is rather common in various genera (Hieracium, Rosa) and numerous hybrids exist in nature by apomixis.

Tetraploids are often self-fertile, triploids have low fertility but, as NAVASHIN proved for *Crepis capillaris,* may sometimes serve as starting points for a series of polyploids. From experimental interspecific crossing it is known that all degrees from fertile to sterile can occur, but that there is a general tendency towards sterility.

BABCOCK accepts hybridization as a modus of origin of species in nature; however, the primary processes in species origin are to him the gene mutations and the chromosome transformations. According to MORGAN and MULLER gene mutations can be experimentally obtained and can arise de novo.

BABCOCK thinks that gene mutation creates the possibility of interspecific differentiation (polymorphic species), but he admits that chemical changes of genes, loss or addition is insufficient to account for differences in chromosome morphology and chromosome number among species of many genera.

Three modes of cytogenetic variation are important: 1. gene variations (mutations), 2. chromosomal variation (addition, rearrangement, translocation, transformation, delation), 3. polyploidy.

As to the species conception BABCOCK constructs seven basic ideas, as follows:

1. Common structural characteristics which unite certain individual organisms into one group, the species. Cytogenetically: the common genetic basis is represented by a specific chromosome complex.

2. Certain characteristic features which distinguish such groups

from each another. Cytogenetically: mostly represented by the chromosome garniture (genom).

3. Relative stability combined with more or less variability. Cytogenetically: made possible by chromosome distribution from cell to cell, inherited variations arising from occasional changes in genes and chromosomes.

4. Common descent of all individuals of the group from one or more preexisting species. Cytogenetically: explained by the mechanism of heredity and genetic variation.

5. Free intercrossing and high (but not necessarily complete) interfertility among the individuals of the group. Cytogenetically: in accordance with the homology of genes in the chromosomes of the individuals.

6. Absence of free intercrossing and usually low fertility if not complete sterility in hybrids between different species (although highly fertile and constant new forms may sometimes arise in this way). Cytogenetically (with a few exceptions): the logical result of accumulation of genic and chromosomal differences between diverging groups of individuals within the species.

7. The facial occurrence of subspecific groups, often occupying different geographic areas which differ more from one another in structure or interfertility or both than do the individuals composing each subgroup. Cytogenetically: this must be regarded as the result of genetic variability within the species, the influence of changes in the environment isolation and of natural selection.

I have quoted BABCOCK (though other geneticists contributed to species conception, such as HALDANE, FISHER a.o.) because in his concept can be seen a trial to conciliate the taxonomic and the genetic ideas, and the points resumed may lead to a cytogenic species definition. Certainly both lines must be followed; morphological and genetic taxonomy are meeting, the mutual interest ends in phylogeny.

The solution of evolution problems is always sought in the origin of species. Suppose we know the origin of species: let it be hybridization or mutation, or both. From species arise again species; neither mutation nor hybridization has shown something else. Hybridization goes the farthest in experimental evolution by bi- and trigeneric hybrids, from which possibly a new genus might arise. Nothing of higher taxonomic rank is formed. It is evident that only a part of a given genetic constitution can be analised. Evolution is not solved with the origin of species; the evolution problem is a phylogenetic one.

As to the bearing of the species conception to phylogeny nothing can be said that is not hypothetic. PLATE (1932). is right when he says that genetics is unable to all apply for phylogenetic needs. The geneticist is interested in the study of the present world, he is working with species of the present time, the last result of evolution; the phylogenist goes back to endless times embracing wider groups than species are. Phylogeny becomes impossible without accepting Lamarckian views of adaptation to some extent. Genes are not characters and only possible in a gene complex interacting in a genetic constitution. Characters and organs cannot be handled a like genes. How should we know that genes manifesting characters, organs, individuals were in constant static condition for geological periods? Perhaps time will come that we are able to understand better static and dynamic processes in evolution and may look upon the problem of acquired characters as a genetically plausible phenomenon.

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NOTES ON THE GENUS DIGITARIA,

with descriptions of new species

by

J. TH. HENRARD.

(Leiden)

(From the press Aug. 1st, 1934)

Some years ago I had the opportunity to study more extensively a very interesting group of grasses, belonging to what is now accepted as a distinct genus, the genus *Digitaria,* formerly belonging as a subgenus to the genus *Panicum.* As to living plants of this group I was familiar with two european species, also found in the Netherlands. They are treated in the Synopsis of ASCHERSON and GRÄBNER and once more in the second edition of this work. Under *Panicum* they bear the names *P. lineare* KROCKER and *P. sanguinale* L. The first species belongs to HACKEL's „*Ternata*", the name is invalid on account of the *Panicum lineare* of LINNAEUS, a species described from India, we know that KROCKER's plant does not occur in India and it is therefore necessary to look for the correct name of the species. A more detailed study of the synonyms and their priority proves that the valid name is that of SCHREBER, published by SCHWEIGGER as *Panicum Ischaemum.* ASCHERSON gave as the date of publication for this name, the year 1811, if this was indeed correct, our species had to bear the name of *Digitaria humifusa* PERSOON, published in the year 1805, the citation of the year 1811 by ASCHERSON is however wrong as SCHREBER's name was published in the year 1804. This is evident from SCHRADER's work, where is published the same species as *Syntherisma glabrum,* this was done in the year 1806 and as a synonym is given the *Panicum Ischaemum* SCHREBER, given in SCHWEIGGER's Flora. It was MUHLENBERG, who, in the year 1817 took up SCHREBER's name under *Digitaria,* he published the species as *Digitaria Ischaemum* with SCHREBER as author. The name of our species, which also occurs in America, is thus **Digitaria Ischaemum** (SCHREB.) SCHREB. ap. MUHLENBERG. It is curious that such a common species escaped to the attention of LINNAEUS. The species is easy to recognize and not

very variable. Among the few varieties the most characteristic one is the var. *prostrata* (ASCH. et GR.) HENR. nov. comb., with long runners rooting at the nodes: the variety *hirta* (JUNGE) HENR. is not so important, the lower sheaths are not always quite glabrous and a more or less distinct pubescence is not rarely observed.

Our second species described as *Panicum sanguinale* becomes under *Digitaria*, the **D. sanguinalis** (L.) SCOPOLI. Botanists who have studied the type in the herbarium of LINNAEUS, indicate that this type represents the european plant treated under this name in our manuals. If we study only the literature of this species, we find that it is common all over the world, there is scarcely any flora where the species is not mentioned, with exception of the cold regions. All the tropical floras give the species as an indian plant and we find it thus in HOOKER's Flora of British India and in the works of the recent Dutch botanists. Many years ago when I saw for the first time the so-called *Panicum sanguinale*, I found already that the javanese plants did not agree with our european *P. sanguinale* and being familiar with the latter in the living state, I was not willing to accept the indian specimens as belonging to our *D. sanguinalis*. Since that time I could study a very extensive material of *D. sanguinalis* from localities all over the world and my opinion on the tropical plants was not changed. That we have two distinct species before us was already pointed out by the american botanist NASH, who accepted the plant from the southern regions of N. America as a distinct species under the name of *Syntherisma marginata* NASH, based upon LINK's *Digitaria marginata* from the year 1821. Having studied LINK's type in the Berlin Herbarium, I recognized it as being indeed the indian D. sanguinalis. LINK gave the locality as Brazil. It is further noteworthy that the very accurate Dutch botanist BUSE did not mention the *Digitaria sanguinalis* in his enumeration of JUNGHUHN's indian grasses. Since NASH accepted the two species as different, modern american agrostologists neglected them in their works and accepted only a *Digitaria sanguinalis*. In the beautiful book of W. A. SILVEUS on the Texas grasses, only the *Digitaria sanguinalis* is taken up, although the typical *D. marginata* occurs there. The plate on p. 489 in SILVEUS's book and also his drawings represent the *D. marginata*, it may be that the true *D. sanguinalis*, although represented in N. America too, is not found in Texas.

European agrostologists, familiar with tropical grasses, had however a better idea and two eminent agrostologists, Prof. PILGER at Berlin and

Dr STAPF at Kew gave more attention to these plants, they both had the same opinion, that the *D. sanguinalis* of Europe was not found in the tropical regions of the world. My opinion that we have thus two different species, is now supported by two such competent agrostologists and in the monograph of the genus *Digitaria*, prepared by me, I have pointed out the geographical distribution of the two species and their taxonomical characters. The form and outline of the spikelets give us good characters to recognize the two species. As is already said the *Digitaria marginata* is the tropical species and being widely distributed and common, it certainly did not escape to the attention of the earlier botanists and it was therefore very probable that there was already a name for the species; described by LINK from South America, the species was found by HUMBOLDT and described in the Nova Genera by HUMBOLDT, BONPLAND and KUNTH as *Panicum adscendens* in the year 1815. I therefore give here the new combination of the species as **Digitaria adscendens** (H. B. K.) HENR.; it was HUBBARD who accepted a still earlier name for the species, the name *Digitaria velutina* P. B. from the year 1812, based upon the *Phalaris velutina* of FORSKAL (1775), a *Digitaria* too. This arabian plant belongs as to the plants seen from the arabian localities, to my opinion to an allied, different species.

There occurs in Europe another interesting *Digitaria*, treated as a variety of *D. sanguinalis* in our manuals under the name of var. *ciliaris*. This name goes back to RETZIUS, who described a *Panicum ciliare* from Java and China. Because the true *D. sanguinalis* is not an inhabitant of the tropics, the plant named *P. ciliare* by RETZIUS cannot belong to the european plant as a variety. It was TRINIUS, who placed the *Panicum ciliare* of RETZIUS as a variety under *Panicum sanguinale*, he followed KOELER, who took up the combination *Digitaria ciliaris* (RETZ.) KOELER, but identified RETZIUS's species with the european form, which is treated here shortly by me. In many species of *Digitaria* of the group of the „*Binata*", where the spikelets are paired along the rhachis, there occur two characteristic variations, these forms we can accept as two subspecies of the same species, they agree in all the characters but differ essentially in the pubescence of the flowers. The common form of *D. sanguinalis* has outer scales (gl. II and III) more or less villous between the nerves and along the margins, the hairs are always soft, adpressed or ultimately spreading. This plant was described by SCHRADER as *Syntherisma vulgare* in the year 1806 and is taken up by me as subsp. **vulgaris** (SCHRAD.) HENR. under *D. sanguinalis*. There occurs another form where the

margins of glume III are provided with curious thick, hyaline, stiff bristles, arising from crateriform tubercles. This is the plant accepted by KOELER as the *Panicum ciliare* of RETZIUS. A study of the indian and malayan material proved that the so-called european var. *ciliaris* does not occur in those regions, although *Digitarias* with such bristles are found in India, they do not belong however to the *D. sanguinalis,* but represent partly the subspecies of the tropical *D. marginata,* partly they belong to other allied species.

From all the data we know at the moment, it is thus evident that the bristle-bearing subspecies of *D. sanguinalis* cannot longer bear the specific name of RETZIUS, as the name, whatever it may represent (there is no specimen in the herbarium of RETZIUS) applies to an indian grass.

Since KOELER and TRINIUS no other name was proposed for the european grass. In my work on *Digitaria,* having sharply separated the indian and the european *D. sanguinalis,* I had to give another name to the subspecies of *D. sanguinalis* with the bristle-bearing spikelets. I propose therefore to call this plant **Digitaria sanguinalis** (L.) SCOP. subsp. **pectiniformis** HENR. nom. nov., based upon the plant described by KOELER and figured by TRINIUS.

The variation between the two subspecies as given here by me is in most cases the only one and we are not justified to accept them as two different species, the other characters of the spikelets in combination with important differences in the vegetative parts are of major importance to limit the species of the genus *Digitaria.* VAVILOV's idea of the parallel variation is especially in the genus *Digitaria* of great importance and a happy solution of the problem. It is not a very bold hypothesis that at least in the group of the „*Binata*'' of the genus *Digitaria,* there occurs in each species such a corresponding subspecies with the characteristic tubercle-based bristles, I have already found different of these forms in many species.

Digitaria Endlichii MEZ, represents the bristle-bearing form of the species, the parallel variation is **Digitaria Endlichii** MEZ, subsp. **Meziana** HENR. nov. subsp. Differt a typo speciei spiculis paullo angustioribus, sed praesertim valvula sterili (gluma III) nervis 7 scabris aequidistantibus percursa, marginibus haud longe fimbriatis, absque setis rigidis subcoloratis; gluma secunda marginibus tantum breviter pubescentibus. Tropical East Africa: Kilimandscharo, ENDLICH no. 751, (type in herb. Leiden); HITCHCOCK no. 25101 from Kenya belongs to the same subspecies.

Digitaria natalensis STENT, subsp. **Stentiana** HENR. nov. subsp.

Differt a typo speciei praesertim gluma tertia absque setulis marginalibus hyalinis rigidis. Type in H. L. B. received from the Salisbury Herb. Southern Rhodesia no. 5706.

Digitaria Nealleyi HENR. nov. spec. Culmi — in specimine meo basi incompleti — decumbentes, superne geniculato-adscendentes, probabiliter haud repentes, multinodes, fere ex omnibus nodis ramosi, glaberrimi, canaliculato-striati, rubescentes; vaginae basales emortuae et tunc culmi nudi, superiores a culmo solutae, internodiis breviores vel subaequilongae, multinervosae, pilis patentibus e tuberculis ortis praeditae; vaginae ramorum internodiis longiores, subhiantes vel arctae, densius pilosae, nodi adpresse pubescentes, ligula vix 1 mm. longa, glabra, hyalina, albo-purpurascens, superne crenulata; laminae erecto-patentes vel patentes, 2—2½ cm. longae, planae, circa 1—2 mm. latae, lineari-lanceolatae, sensim acutatae, griseae vel supra violascentes, multinervosae, granulato-scaberrimae, marginibus undulatis scabris subincrassatis, nervo mediano subtus parum prominulo, utrinque praesertim inferne pilis longis basi tuberculatis fimbriatae, pedunculus, in speciminibus examinatis, haud longe exsertus; panicula erecta, axis abbreviatus, racemis paucis, rhachi triangulari-applanata, marginibus scabris; spiculae binae, altera pedicello ipsa ½ breviore, altera ipsa plus triplo breviore fulta, pedicellis triquetris scabris, spiculae lineari-lanceolatae, superne leviter angustatae, 3—3¼ mm. longae, 0 6—0.7 mm. latae, gluma inferior distincta, enervis, triangulari-acuta, haud raro apice rotundata, gluma superior spicula ⅓ brevior, lanceolata, acuta, 3-nervis, inter nervos et versus margines pilosa vel villosa, gluma III (sterilis) spiculam aequans, lineari-lanceolata, 7- vel sub-7-nervis, nervis aequidistantibus, dorso subglabra, marginibus villosis, gluma IV (fertilis) vix 3 mm. longa, sensim acutata, viridis, leviter punctulato-striolata.

TEXAS, collected by G. C. NEALLEY in the year 1884. Herb. HACKEL Vienna.

Digitaria dolichophylla HENR. nov. spec. Annua, dense caespitosa; culmi erecti, tenues, gracillimi, glaberrimi, simplices, longissimi, teretes, vix striati, cum inflorescentia plus quam 60 cm. alti, circa 4—5-nodes, nodis glabris, nodo summo vix 20 cm. supra basin culmi sito; foliorum vaginae infimae abbreviatae, valde nervosae, adpresse hirsutae, inferiores glabrescentes, tantum inferne supra nodos subpilosae, ore marginibusque sparse pilosis, internodiis sublongiores, vaginae superiores omnino glaberrimae, internodiis breviores, auriculae productae, ligula glabra, hyalino-fusca, subtruncata, circa 1½ mm. longa, cum auriculis connata; vaginae

ultimae longissimae, folia in basi culmi aggregata, laminis longissimis, involutis, vi explanatis circa 1 mm. latis, supra leviter pubescentibus, ad basin pilis nonnullis praeditis, setaceo-acuminatis, 25 cm. vel plus longis, circinnatim curvatis vel flexuosis, laminae foliorum culmeorum breviores; pedunculus longissimus longe exsertus, tenuissimus; racemus solitarius (raro racemi bini subconjugati), tenuissimus, vulgo ad 10 cm., haud raro ad 15 cm. vel plus longus, axis si adest circa 1 cm. longus, subangulatus, scabriusculus, rhachis filiformis, trigona, vix marginata, scabra; spiculae ternatae, adpressae, haud dense imbricatae, vel inferne remotae, pedicellis aculeolato-scabris, subtriquetris inaequalibus, primario spiculam superante, secundario ea paullo breviore, tertiario pluries breviore fultae, anguste lanceolatae, 1.5—1.6 mm. longae, 0.6 mm. latae, inferne et superne angustatae, viridulae, gluma inferior deest, gluma superior spicula circa ¼ brevior, ea distincte angustior, praesertim superne, subacuta, 3-nervis, inter nervos et praesertim versus margines pilis longiusculis apice capitellatis praedita, gluma III sterilis plana, circa 5-nervis, nervis aequidistantibus, lanceolata, apice rotundata, spicula paullo sed distincte brevior, inter nervos laterales et versus margines eodem modo ac II pilosa sed juxta nervum medium glabra, gluma IV fertilis spiculam aequans, lineari-lanceolata, distincte apiculata, apiculo exserto, punctulato-striolata, atro-violacea.

FLORIDA: Dade County; Buena Vista, 5 Dec. 1903 leg. A. A. EATON no. 459. Distributed from Ames Laboratory, North Easton Mass. Typus in H. L. B.

Digitaria rhachitricha HENR. nov. spec. Probabiliter annua (in specimine meo radices desunt). Culmi erecti, glabri, elongati e nodis superioribus parum ramosi, ramos breves floriferos solitarios gignentes; vaginae arctae vel superne hiantes, teretes, nervosae, marginibus hyalinis, dense patule hirsutae, pilis longis, albis, basi tuberculatis praeditae, nodis glabris parum prominulis; ligula brevissima, subtruncata, pilosula; laminae e basi subaequilata lineares, planae, sensim angustatae, acutae sed haud acuminatae vel setaceae, ad 3 mm. latae, 10—12 cm. longae, vel interdum longiores, nervo mediano albo subtus prominulo percursae, undique dense patule pilis basi tuberculatis hirsutae; pedunculus exsertus, elegans, teres, striatus, glaber; panicula subracemosa vel subdigitata, axis communis circa 3 cm. longus, triangularis, scaber, longe villosus, racemi circa 5, elegantes, subsolitarii, sessiles, erecti vel erecto-patuli, 10—12 cm. longi, ad insertionem longe villosi, inferne prope basin quasi subramosi, rhachi subtrigona, angustissime viridi-marginata, marginibus scabris hir-

sutis, pedicellis trigonis, scabris, pilis brevissimis hirsutis; spiculae ternae, sed ad basin racemorum inferiorum quaternae-senae (vel rariter septenae) ibique racemulos ad 1 cm. longos formantes, 1.5—1.6 mm. longae, ovato-oblongae, superne subacuminatae, pedicellis inaequilongis, primario spiculam superante, secundario ea paullo, tertiano pluries breviore fultae: gluma inferior minuta, annulato-evoluta, gluma superior anguste lanceolata, acuta, spiculam paullo brevior et distincte angustior, 3-nervis, inter nervos et versus margines pilis longiusculis subrigidis leviter capitellatis munita, gluma III sterilis 5-nervis, spiculam aequans, juxta nervum medium glabra, inter nervos laterales et versus margines puberula, gluma IV fertilis apiculata, apiculo pallido haud exserto, atro-violacea, striolato-punctata.

AMERICA AUSTRALIS: Columbia, leg. FUNCK et SCHLIM no. 724. Type in H. L. B.; Santa Marta, leg. H. H. SMITH no. 187, cotype in H. L. B.

Digitaria divaricata HENR. nov. spec. Annua, culmi basi decumbentes ad nodos radicantes, superne adscendentes, plurinodes, e nodis inferioribus ramosi, glaberrimi, angulati, canaliculati, superne subcompressi, cum panicula 50 cm. vel plus longi, ad nodos pilosulae vel glabrescentes; vaginae internodiis breviores, vel eae ramorum longiores, inferne sparse patenter pilosae, pilis basi tuberculatis, superne haud raro glabrescentes, multistriatae, marginibus albis hyalinis, arctae vel eae ramorum superne hiantes vel a culmo solutae, ligula alba, scariosa, vix 2 mm. longa, glabra; laminae e basi subrotundata lanceolatae vel lanceolato-lineares, ad 1 cm. latae, circa 7—8 cm. longae vel eae ramorum circa 4 mm. latae, tenuinerves, multinervosae, nervo medio albo praesertim subtus conspicuo praeditae, utrinque plus minus pilis adspersae, marginibus undulatis scabris, sensim acutatae haud setaceae; pedunculus inflorescentiae erectus, exsertus, valde striatus, subteres, glaber; panicula patula, circa 8 cm. longa, axis communis circa 5 cm. longus, anguloso-striatus, glaber, racemi remoti, ad 15, inferne bini vel terni, superne solitarii, divaricati, angulo recto patentissimi, ad 7 cm. longi, graciles, simplices vel inferne haud raro racemos secundarios edentes, racemi superne sensim decrescentes, subregulariter dispositi, in axillis pilis longis praediti, rhachi racemorum alba, plana, angustissime sed bene viridi-marginata, spiculis angustiore; pedicelli subtriquetri, scabri, superne haud vel leviter tantum patellati; spiculae adpressae, superne binatae, inferne haud raro ternae vel quaternae, subsessiles vel primariae bene pedicellatae, pedicello ad 1—1.5 mm. longo praeditae, lanceolatae, virides, angustae, 1.8 mm. longae, circa 0.6 mm. latae, inferne et superne regulariter angustatae haud acuminatae,

gluma inferior deest vel rudimento minutissimo indicata, gluma superior spicula paululo brevior, 5-nervis, inter nervos adpresse pilosula, gluma III regulariter 7-nervis, nervis aequidistantibus, glabra sed marginibus ut in gluma II pilosula, gluma IV vix ½ mm. lata, spicula paullo brevior, subfusiformis, vel lineari-lanceolata, bene apiculata, minutissime punctulato-scaberula.

AFRICA ORIENTALIS: Nyasaland; Kyimbila, 1350 m.s.m. legit A. STOLZ in 1911 no. 635. Type in H. L. B.

Digitaria Eggersii (HACK.) HENR. nov. comb. *Panicum Eggersii* HACKEL, formerly accepted as a member of the genus *Trichachne* is now placed by me under *Digitaria*. There are so many intermediate species between the genera *Digitaria* and *Trichachne* that we cannot maintain the latter.

Digitaria collina SALISBURY is proved to be only a nomen nudum given for *Andropogon Ischaemum* L. The specific name *Panicum collinum*, given by BALANSA to a species from New Caledonia is therefore valid under *Digitaria*, and becomes **Digitaria collina** (BALANSA) HENRARD nov. comb.

Digitaria campestris HENRARD nom. nov., based upon ARECHAVALETA's *Panicum ramosum* which is not the *P. ramosum* of L., it is allied to the *Digitaria aequiglumis* PARODI but has shorter spikelets and differs in the vegetative parts too. I saw a very beautiful specimen in HACKEL's herbarium, quite agreeing with ARECHAVALETA's plate.

Digitaria mollicoma (KUNTH) HENR. nov. comb. = *Paspalum mollicomum* KUNTH, = *Paspalum molle* PRESL non POIRET.

Digitaria polyphylla HENRARD nom. nov. = *Digitaria foliosa* STENT, non Lagasca. South Africa.

Digitaria Stentiana HENRARD nom. nov. = *Digitaria glauca* STENT, non CAMUS. South Africa.

Digitaria dispar HENRARD nom. nov. = *Panicum heteranthum* NEES et MEYEN (1843) non LINK (1827).

Digitaria latronum HENRARD nom. nov. = *Digitaria marianensis* MEZ (1924), non *Digitaria mariannensis* MERRILL (1914).

Digitaria Dinteri HENRARD nov. spec. Perennis, dense caespitosa, innovationes extravaginales, basi squamis villosis cinctae, erectae. Culmi simplices, stricte erecti, glabri, striati, vix sulcati, pedunculo paniculaque ad 60 cm. alti vel interdum tantum ad 30 cm. longi, subuninodes, nodo superiore in $^1/_6$ inferiore culmi sito, internodio infimo circa 10 cm. longo, supremo (pedunculo) longissimo; squamae basales valde striatae, apppresse

hirsutae, ovato-lanceolatae vel lanceolatae. Folia fere omnia in basi culmi aggregata, vaginae innovationum compressae, culmeae subcompressae vel subteretiusculae, arctae, interdum subcarinatae, multinervosae, inter nervos hirsutae pilis patentibus rigidis longissimis, basi tuberculatis praeditae, vaginae foliorum culmeorum internodiis circa duplo breviores, nodis minute pubescentibus vel glabris, supra nodos annulo dense piloso praeditae; ligula brevis, circa ½ mm. longa, longe firmbriata, auriculae lateraliter barbatae. Folia pallide glauca, laminae planae, eae culmorum circa 2 mm. latae, haud longae, eae innovationum paulo angustiores, circa 15 cm. vel plus longae, sensim longe setaceo-acuminatae, multinervosae, nervo mediano albo crassiusculo valde prominulo percursae, marginibus albis incrassatis haud flexuosis, subscaberulis praeditae, undique pilis rigidis patentibus basi tuberculatis hirsutae; pedunculus longe exsertus, gracilis, striatus, subscaberulus, viridis vel viridi-violascens; racemi digitati vel secus axin communem ad 1 cm. longum solitarii vel superiores digitati, erecti vel erecto-patuli, vulgo ad 6 cm. longi, densiflori, a basi breviter nudi, ad insertionem incrassati ibique densiter pubescentes vel villosi, axis communis triquetrus, scaberulus, racemi circa 6 (—4), aequales, rhachi spiculis angustiore, anguste viridi-marginata, subtrigona, angulis scabra; spiculae binatae, pedicellis subteretibus scaberulis apice leviter patellatis, altero spiculam aequante, altero ea quadruplo breviore fultae, lineari-lanceolatae, circa 2.2—2.4 mm. longae, longe pilosae, pilis ultra apicem glumae productis et tunc spiculae 2.8—3 mm. longae; gluma inferior triangulari-acuta, brevissima, purpurascens, circa 0.3 mm. longa, enervis, gluma superior subulato-lanceolata, 3-nervis, spicula $^1/_3$ brevior, ea paulo angustior, inter nervos et versus margines densissime longe villosa, villis copiosis, porrectis, ultra apicem glumae ita productis ut gluma fertilis totaliter obtecta sit, nervis haud vel vix visibilis, gluma III sterilis 7-nervis, lanceolata, villosissima, ciliis porrectis ultra apicem glumae penicillatim productis, gluma circa duplo brevioribus, albo-purpurascentibus; gluma IV fertilis spiculam subaequans, circa 2 mm. longa vel paulo longior, lanceolata acuta vix acuminata, viridula, minute puncticulato-striolata.

Great Namaland, South West Africa: Windhoek, 1600 m.s.m. april 1912. leg. K. Müller in Herb. Dinter no. 2573. Typus in H. L. B.

Other specimens seen: Great Namaland; Dinter no. 4479 (Herb. Berlin). Huib plateau, between Ausis and Khuias in 1855 leg. Schenck (Hackel herb. Vienna.)

Baron FERDINAND VON MUELLER indicated in his Fragmenta Phytographiae from the year 1874 a *Panicum autumnale.* His type was the plant from Sweer's Island, collected by HENNE. BENTHAM placed this plant as a var. *leiostachyum* under *Panicum papposum* R. BR. It is however widely different from the latter and very different from the american plant too. The species is taken up in my work as **Digitaria Benthamiana** HENRARD, nom. nov.

The genus *Trichachne,* as accepted by American agrostologists, is treated in my monograph very extensively, to demonstrate that the characters for separating this genus are very inconstant and insufficient to maintain the genus if we study the *Digitarias* of the world. Properly spoken the genus is as to its habit only restricted to the New World. The australian species *Digitaria Brownii* (R. ET S.) HUGHES, which has the long villous spikelets too, is a true *Digitaria* and *D. tricholaenoides* STAPF from South Africa (which is *Panicum tunicatum* HACK.) has still a more beautiful dense tomentum on the spikelets, it is in the fertile lemma and other characters of the fruit however a *Digitaria.* The long acute fruit of the typical *Trichachne insularis* is not observed in some other American species of *Trichachne.* The stipitate fruit of the genus *Trichachne* occurs also in true *Digitarias.* For a local flora the genus *Trichachne* is to limit, but, as is already said, going over all the *Digitarias* of the world, no constant character is found and the consequence is therefore that we have to unite *Trichachne* and *Digitaria.*

STAPF, HUGHES and others did not accept the genus *Trichachne* for Tropical and South Africa and Australia. I formerly accepted *Trichachne* as a genus, but found it afterwards impossible to define it sharply and all attempts, even those of Mrs. A. CHASE, in her beautiful work on the *Paniceae,* have failed. The different species formerly accepted in the genus *Trichachne* are not easy to separate, they are for the moment taken up as **Digitaria insularis** (L.) MEZ, **D. sacchariflora** (RADDI) HENR., **D. californica** (BENTH.) HENR., **D. patens** (SWALLEN) HENR., **D. tenuis** (NEES) HENR., **D. Hitchcockii** (CHASE) STUCKERT, **D. Sellowii** (MÜLLER) HENR., and **D. laxa** (REICHB.) PARODI.

Digitaria Neesiana HENRARD nom. nov. = *Trichachne velutina* NEES, non *Digitaria velutina* P. B. nec HITCHCOCK. = *Panicum vestitum* KUNTH, non *Digitaria vestita* FIGARI et DENOTARIS. Brazil.

Digitaria Pittieri (HACKEL) HENRARD nov. comb. = *Panicum Pittieri* HACKEL, = *Valota Pittieri* (HACK.) CHASE.

Milium tomentosum KOENIG was described by WILLDENOW in the year

1803, the same species was published by ROTH in the year 1817 in ROEMER and SCHULTES's Systema Vegetabilium as *Milium capillare*; TRINIUS published it as *Panicum subeglume* and STEUDEL applied to it WIGHT and ARNOTT's name *Panicum Browneanum*. Wight no. 3037 is as to the characters of the spikelets and the fruits a *Digitaria*, both glumes are present only as rudiments. I have therefore named the species **Digitaria tomentosa** (KOEN.) HENR. nov. comb.

The species is only known from British India and is in its technical characters somewhat allied to *Digitaria thyrsoidea* BALANSA and *Digitaria quinhonensis* GAMUS which have a very distinct upper glume and are in their panicles intermediate between *Leptoloma* and *Digitaria*, the former genus is not accepted in my work.

Digitaria jubata (GRISEBACH) HENR. nov. comb. = *Paspalum jubatum* GRISEBACH. Is accepted by HOOKER as distinct from *Digitaria pedicellaris* and I am of the same opinion. Even if we unite te two species the name given by GRISEBACH has priority.

Two species from British India are characteristic members of the „*Binata*"; they were described by HOOKER as varieties under his *Paspalum sanguinale* but treated by me as distinct species.

Digitaria Griffithii (ARNOTT) HENRARD nov. comb. = *Paspalum sanguinale* HOOKER, var. *Griffithii* HOOK. f.

Digitaria extensa (NEES et ARNOTT) HENRARD nov. comb. = *Paspalum sanguinale*, var. *extensum* HOOKER f.

Digitaria caledonica HENRARD nov. spec. Caespitosa, stricte erecta, radicibus tenuibus, innovationibus paucis, rhizoma deest, probabiliter annua vel biennis, hinc inde squamulis ad basin culmi praedita; culmi teretes, glaberrimi, superne subangulati, stricti, cum panicula ad 40 cm. alti, circa 5-nodes, nodo summo in medio culmo vel infra medium sito, nodis glabris; vaginae glabrae, inferiores inter nervos scaberulae, superiores glaberrimae, compressiusculae, internodia superantes, ligula abbreviata, 1—1½ mm. longa, albo-fusca, hyalina, obtusa, scariosa; laminae e basi subaequilata lineari-lanceolatae, vulgo 10—12 cm. longae, ad 5 mm. latae, sensim acutatae, utrinque glabrae vel subscaberulae, marginibus vix incrasatis, multinervosae, nervo medio albo crasso praesertim inferne conspicuo praeditae, apice leviter, ob marginibus involutis, contractae, haud pungentes, pedunculus inflorescentiae longe exsertus, glaberrimus, striatus; panincula bene digitata, cuneata, 9—11 cm. longa, axis communis abbreviatus, 1½—2½ cm. tantum longus, canaliculato-striatus, glaber, racemi erecto-adscendentes vel stricti, solitarii vel interdum sub-

binati, inter se distantes, simplices, inferiores paniculum aequantes, superiores sensim decrescentes, rhachi recta spiculis subaequilata, nervo medio crasso praedita, bene viridi-marginata, marginibus scaberulis; spiculae vix 1½ mm. longae, ternae vel ad basin racemorum quaternae, propter pedicellum primarium basi adnatum binae et solitariae, glaberrimae, pedicelli abbreviati, subteretes, subscaberuli, parum inaequilongi, spicula breviores, gluma inferior deest vel vix indicata, gluma superior spicula ⅓ brevior, ea haud angustior, bene late rotundata, 1 mm. longa, convexa, 3-nervis, nervo medio percurrente, lateralibus apice anastomosantibus, gluma III plana, spicula paullo brevior, apice etiam rotundata, 3—5-nervis, nervis 3 vulgo crassioribus sub apice nervo medio anastomosantibus, spiculae subsessiles (secundariae et tertianae) vulgo 3-nervis. spiculae longiter pedicellatae (primariae) vulgo 5- vel 4-nervis, gluma IV (fertilis) ovato-lanceolata, bene acutata sed haud vel vix acuminata, apice exserta et bene visibilis, convexa, striolato-puncticulata, atropurpurea.

NOVA CALEDONIA: Nouméa; legit BALANSA 1868—1870 no. 1730 sub nom. *Paspalum brevifolium* FLUEGGE. Typus in H. L. B.

Allied to this new species are two australian ones, neglected since they were described:

Digitaria patula (HORNEMANN) HENR. nov. comb. = *Paspalum patulum* HORNEMANN.

Digitaria ramularis (TRINIUS) HENRARD nov. comb. = *Panicum ramulare* TRINIUS.

Digitaria Thwaitesii (HACKEL) HENR. nov. comb. = *Panicum Thwaitesii* HACKEL. Ceylon.

Digitaria tricostulata (HACKEL) HENR. nov. spec. = *Panicum puberulum* KUNTH, var. *tricostulatum* HACKEL. Natal.

Digitaria livida HENR. nov. spec. Perennis, caespitosa, innovationibus extravaginalibus, basi squamis aphyllis hirsutis, valde nervosis praedita; culmi erecti vel inferne subadscendentes, striato-sulcati, cum panicula circa 60 cm. alti, sat validi, circa 3-nodes, nodo summo in medio culmo sito, nodis glabris; vaginae internodiis paulo longiores vel paulo breviores, valde nervosae, teretiusculae, superne hiantes, superiores glaberrimae, inferiores praesertim superne pilis longis, sparsis, rigidis, basi tuberculatis praeditae, marginibus subhyalinis angustis; ligula brevissima, 1 mm. longa, hyalina, glabra vel minute pubescens, apice distincte ciliata, auriculae incrassatae, brunneae, haud raro productae; laminae obscure virides, lividae, inferne subcarinatae, nervo mediano albo crasso

supra et subtus bene prominulo praeditae, circa 4—5 mm. latae, e basi aequilata lineares, sensim angustatae, apice leviter convolutae quasi setaceae, ad 15 cm. longae, marginibus albis undulatis, incrassatis, laevibus, vel minute scaberulis praeditae, glabrae vel inferne ad basin pilis nonnullis albis, longis, basi tuberculatis, obsitae; pedunculus strictus, teres, crassus, striatus; panicula erecta, axis communis circa 1½ cm. longus, racemi circa 8, digitati, porrecti, in axillis pubescentibus, sessiles, subaequilongi, ad 10 cm. longi, virides, dense spiculati, spiculis imbricatis, rhachi recta, spiculis subaequilata, 0.6 mm. lata, valide albo-striata, margine viridi latitudine striae cincta, margine scabra; spiculae binatae, pedicellis scabris, triquetris, altera pedicello ipsa subaequilonga, altera ipsa multo breviore fulta, virides, lineari-lanceolatae, acutae, superne leviter sed distincte acuminatae, 3—3.2 mm. longae, gluma inferior parvula, triangulari-acuta, enervis, glabra, superior spicula $^{1}/_{5}$ brevior, vel haud raro spiculam subaequans, lanceolata, 3-nervis, inter nervos et versus margines longe porrecte villosa, gluma III sterilis 7-nervis, nervis aequidistantibus, dorso subglabra, juxta nervum medium glabra, marginibus dense longiter adpresse villosa, villis vix ultra apicem glumae exsertis, gluma IV fertilis viridi-purpurascens, spiculam subaequans vel eam paulo brevior, lanceolata, acuta, minute puncticulato-striolata.

SOUTHERN RHODESIA: Matabeleland; District Belingwe, Gold Fields (southeast of Bulawayo) leg. POTTENSY, 11. 2. 1932 no. 5503, ex Government Herbarium Salisbury, southern Rhodesia. Typus in H. L. B.

Digitaria lancifolia HENR. nov. spec. Culmus — in specimine basi incompletus — decumbens, demum adscendens, plurinodus, e nodis inferioribus ramosus, ramis sterilibus elongatis erectis, ad nodos glabros radicans; internodia ad basin culmi 3 cm longa, sensim accrescentia, glaberrima, compressa, carinata, leviter striata, purpurascentia; vaginae internodiis breviores, laxiusculae, hiantes, apice a culmo solutae vel eae ramorum arctae, multinervosae, plus minus carinatae, inter striis hirsutae, pilis basi tuberculatis, praesertim ad margines, ligula fusca, membranacea, glabra, lacera, abbreviata, truncata, circa 1 mm. longa; laminae e basi subcordata lanceolatae, sensim acutatae sed haud acuminatae, 5—7 cm. longae, circa 1 cm. latae, multinervosae, nervis primariis circa 11, subaequidistantibus, crassiusculis percursae, nervis secundariis numerosis indistinctis, nervo medio crasso albo valde prominulo, scabrae, pilis longis sparsis basi tuberculatis praeditae, marginibus crispis leviter incrassatis, flaccidae; panicula erecta, longe pedunculata, pedunculo circa 20 cm. longo, nudo, glabro, striato, inflorescentia flabellata, bene bipinnata circa

17 cm. longa, siccando ad 15 cm. lata, axis 10.5 cm. longus, glaber, canaliculatus, superne in racemum erectum, 5 cm. longum abiens, racemi erecto-patuli, numerosi, ad basin paniculae verticillati, superne binati vel solitarii, subaequidistantes, inferiores inferne regulariter pinnati, ad 14 cm. longi, ramulis erecto-patentibus ad 4 cm. longis, superiores sensim decrescentes et in racemum simplicem abeuntes, ramuli etiam subaequidistantes, racemi ultimi minus ramosi vel simplices, spiculae et ramuli in paniculam aequaliter vel subaequaliter dispositae, rami ramulisque triquetri, angustissime vel vix marginati, scabri, in axillis puberuli, racemi hinc inde prope basin pilis albis paucis praediti; spiculae erectae, inferne haud raro 4—5-natae, superne ternatae, summae binatae, pedicellis inaequilongis, longiores 2—3 mm. vel plus longae, breviores haud raro vix 1 mm. longae; spiculae vix 2 mm. longae, vix ¾ mm. latae, lineari-lanceolatae, viridi-purpureae, gluma inferior adest, triangularis, $^1/_{10}$ spiculae aequans, glabra, gluma superior concava, spiculam brevior, circa 1.4 mm. longa, ovata, acuta, 3-nervis, inter nervos et versus margines pilis adpressis praedita, gluma III (fertilis) spiculam aequans, apice cucullata, circa 5-nervis, juxta nervum medium glaberrima, cetera pilis adpressis ut in II praedita, gluma IV leviter acuminata, punctulato-striata, purpurascens.

AFRICA ORIENTALIS: Nyassa Hochland, Station Kyimbila, 16—1800 m.s.m. leg. A. STOLZ no. 1237. 3/5. 1912. Typus in H. L. B.

Digitaria tangaensis HENR. nov. spec. Perennis, longe repens, stolonibus crassis, multinodis, squamosis praedita, squamis multinervosis, inter nervos minute puberulis; culmi sine paniculis ad 50 cm. longi, plurinodes, subcompressi, striati vel canaliculati, glaberrimi, nodis glabris; vaginae valde striatae, carinatae, glabrae, inferiores internodiis longiores, summae interdum valde elongatae, hiantes, ligula glabra, truncata, abbreviata, vix ½ mm. longa; laminae lineares, subtus carinatae, tenuinerves, nervo medio valde prominulo, glabrae, marginibus undulatis subincrassatis, planae, 3—4 mm. latae, valde inaequilongae, circa 10 cm vel haud raro multo longiores, superne ad apicem leviter involutae et sensim acuminatae; inflorescentia 8—9 cm. longa, pedunculo glabro circa ½ mm. crasso; panicula e racemis circa 8 formata, rhachi communi 3—5 cm. longa, inferne teretiuscula, striata, superne valde sulcata vel canaliculata, glabra, ramis solitariis vel interdum hinc inde geminatis, remotis. Racemi inferiores paniculae ad 5 cm., superiores ad 4 cm. lg., omnes gracillimi, laxiflori, dorso plani, ventre carinati, marginibus vix alatis, rhachi quasi trigona, glaberrima, ad insertionem vix vel minutissime puberula. Spi-

culae binae, pedicellis tenuibus, teretibus, laevibus, apice leviter patellatis, altero spiculam aequante vel subaequante, altero eam plus quam triplo breviore fultae, spiculae 2 mm. longae, vix 3/4 mm. latae, pallide brunneae, lineari-lanceolatae, gluma I spicula 6-plo brevior, triangulari-ovata, enervis, glabra; II spicula distincte sed paullo brevior, lanceolata, apice rotundata, herbaceo-membranacea, quiquenervis, nervis ut videtur haud anastomosantibus, haud excurrentibus, inter nervos medianos brevissime longitudinaliter puberula, versus margines breviter ciliolata; gluma III spiculam aequans, lineari-lanceolata, acuta, elevate 5-nervis, nervis aequidistantibus, juxta nervum medium glaberrima, ceterum longitudinaliter puberula; gluma IV (fertilis) spiculam aequans, lineari-lanceolata, acuminata, punctulato-striata, scaberula, violascens.

Africa orientalis: Kigombe in districtu Tanga. B. L. Institut Amani. no. 1613. leg. G. Scholz. 5. 1. 1908. Typus speciei in Herb. Berolinensis.

Digitaria proxima Henr. nov. spec. Perennis, probabiliter caespitosa, culmi erecti, simplices, circa 4-nodes, superne longe nudi, basi squamis villosis praediti, glabri, lateraliter compressi, longitudinaliter sulcati vel superne striati, nodis patentim barbatis, nodo summo circa medium culmi sito; vaginae arctae vel lateraliter compressae, dense striatae, superne plus minus hiantes, inferiores breviores, internodiis longiores, superiores valde elongatae, patule villosae vel pubescentes, pilis basi tuberculatis, ligula glabra, lacera, fulva, basi pilis stipata, laminae lineari-lanceolatae, multinervosae, nervo medio subtus valde prominulo, marginibus scabris undulatis parum incrassatis, ad 5 mm. latae, ad 15 cm. longae vel inferiores breviores, subadpresse vel patule villosae, sensim acutatae, apice leviter involutae; inflorescentia longe pedunculata, pedunculus teres, striatus, interdum ad 50 cm. longus, praesertim superne pilis albis longis sparsis patentibus praeditus; panicula densa, contracta, cuneata, ad 20 cm. longa, axis elongatus, inferne subcarinatus, superne angulatus, scaber, hinc inde ut in pedunculo, pilis albis ornatus; racemi numerosi, omnes gracillimi, laxiflori, inferiores ad 12 cm. longi, superne sensim decrescentes, in axillis pubescentes et hinc inde praesertim ad basin pilis longis praediti, rhachi trigona, dorso applanata, ventre carinata, anguste marginata, scabra; pedicelli bini vel ad basin racemi terni vel quaterni, scabri, trigoni, alter spiculam aequans vel superans, alter ea triplo vel plus brevior; spiculae lineari-lanceolatae, viridi-purpurascentes, 2½ mm. longae, circa 3/4 mm. latae, acutae sed haud acuminatae, gluma inferior deest vel vix evoluta, gluma II et III aequilongae, IIda 7-nervis, inter nervos et versus margines pilis adpressis vestita, gluma IIIa

7-nervis spiculam aequans, juxta nervum medium glabra, gluma IVa spiculam aequans, lineari-lanceolata, acuminata et distincte apiculata, convexa, punctulato-striata, scaberula, livide violascens.

AFRICA ORIENTALIS: District Uhehe, Iringa, prope Kambi ya mboga. Amani Institut no. 2603. leg. ZIMMERMANN 20. 2. 09. Typus speciei in Herb. Berolin.

Digitaria Zeyheri (NEES) HENR. nov. comb. = *Panicum Zeyheri* NEES, Fl. Afric. austr. (1841). The *Digitaria horizontalis*, as described by WILLDENOW from the New World, was accepted by STAPF as an inhabitant of tropical Africa. The east African plants from Abyssinia and South Africa differ in important characters from the New World plants, the latter have a very distinct lower glume and an upper one ½ as long as the spikelet. The specimens from Abyssinia and the plants described as *Panicum Zeyheri* have a wanting or much reduced lower glume and a much longer upper one, ²/₃ as long or nearly as long as the length of the spikelet. Such plants were described (or issued in exsiccatae by HOCHSTETTER) as *Panicum psilostachyum* HOCHST. (Schimper 2256); *Panicum horizontale* RICHARD (Schimper 1618); *Panicum fenestratum* HOCHST. (Schimper 85) and *Panicum Zeyheri* NEES (Drège). It is noteworthy that the very accurate NEES did not mention the true *Digitaria horizontalis* from South Africa and described only 2 varieties (*glabriusculum* and *subcompositum*). His *P. Zeyheri* was indicated as having an obsolete lower glume and an upper one ¹/₃ shorter than the spikelet, two important differences with the actual *D. horizontalis*. Accepting the east african plants as a succedaneous species of the *D. horizontalis*, I have given it the earlier name published by NEES. Some abyssinian plants of HOCHSTETTER may represent once more a different species as *D. fenestrata* RENDLE.

Digitaria Gardneri HENR. nov. spec. Annua, florendi tempore innovationibus nullis. Culmi stricte erecti, longissimi, simplices, circa 5—6-nodes, nodis glaberrimis, nodo summo circa prope medium culmi sito, cum panicula plus quam 1 m. alti, teretes, vel superne subcompressi, glaberrimi; vaginae striato-sulcatae, inter striis pilis basi tuberculatis obsitae, internodiis longiores, apice vulgo hiantes vel partim a culmo solutae, ligula brevissima, vix 1 mm. longa, puberula, apice subscariosa, pilis longis stipata; laminae e basi subaequilata lineares, complicatae, explicatae 3—4 mm. latae, 15 cm. vel plus longae, erectae, multinervosae, nervo mediano crasso valde prominulo praeditae, nervis primariis subaequalibus crassiusculis percursae, secundariis tenuissimis, marginibus

scabris haud incrassatis, pagina superior pilis sparsis praesertim inferne praedita, pedunculus teres, elegans, longissimus, inflorescentia erecta, cuneata, subfastigiata, racemi circa 6, secus axin communem ad 5 cm. longum solitarii vel superiores oppositi, axis teretiusculus, scaber, racemi ad 15 cm. longi, vel superiores circa 12 cm. longi, inferne sublaxiflori, superne subdensiflori, in axillis pilosi, rhachi trigona, spiculis multo angustiore, scabra, vix vel angustissime viridi-marginata, marginibus scabris, spiculae vulgo ternatae, pedicellis tenuibus, linearibus, scaberrimis, vix patellatis, primario spiculam multo superante, secundario et tertiario pluries breviore fultae, racemi inferiores ad basin quasi ramosi, ibique racemuli secundarii formantes et tunc 5—6-ni, spiculae 2 mm. longae, 0.7 mm. latae, ovato-lanceolatae, leviter sed distincte acuminatae, gluma inferior deest vel margo indistincto indicata, gluma superior spicula circa ¼ brevior, lanceolata, acuta, 3-nervis, pilis longis undique villosa, pili ultra apicem glumae producti, gluma III spiculam aequans, circa 5-nervis, juxta nervum medium glabra, ceterum adpresse pilosa, pilis strictis, sat rigidulis, fulvis, vel rufidulis, apice non clavatis, porrectis, ultra apicem glumae subpenicillatim productis, gluma IV (fertilis) 1.8 mm. longa, apiculata, distincte puncticulata, atro-purpurea.

BRASILIA: Piauhy in 1839 leg. GARDNER no. 2340. Typus speciei in Herb. Lugd. Bat. sub no. 934. 121—149.

In the group of the annual *Ternata* very characteristic by the stiff, rather rigid rufous hairs on the sterile lemma.

Digitaria villiculmis HENR. nov. spec. Probabiliter annua, sed tempore florendi innovationibus sterilibus paucis munita. Culmi cum paniculis ad 45 cm. alti, stricte erecti, binodes, nodis constrictis, villosis, nodo summo infra medium culmi sito, internodia dense erecto-adpresse villosa, pilis basi tuberculatis, pedunculus exsertus, sulcatus, longe patenter pilosus, pilis sordide albis vel subrufidulis; vaginae striatae, dense adpresse villosae, internodiis breviores, ligula vix 1 mm. longa, glabra, hyalina, superne fusca, scariosa; laminae e basi subaequilata lineares, sensim subsetaceo-acutatae, inferiores angustae, 8—9 cm. longae, culmeae planae, multo longiores, interdum 20 cm. longae, ad 3 mm. latae, undique dense villosae, nervo medio prominulo crasso, nervis secundariis distinctis praeditae, marginibus leviter involutis; inflorescentia erecta, e spicis duabus formata, racemus inferior circa 6 cm. longus, sessilis, erecto-patens, superior circa 9 cm. longus, stricte erectus, pedunculatus, pedunculo 1—1½ cm. longo, angulis villosis, racemi ad insertiones villosi; spiculae ternatae subdense imbricatae, rhachi trigona, villosa, vix viridi-

marginata, angulis scaberulis, pedicelli scabri, triquetri, ad apicem distincte patellati, sparse longeque pilosi, pilis superioribus ultra apicem excedentibus, pedicellus primarius spiculam circa duplo superans, secundarius eam subaequans, tertiarius illa circa duplo brevior; spiculae ovato-ellipticae, 1.8—1.9 mm. longae, circa 1 mm. latae, undique pilis brevibus distincte clavatis dense puberula, gluma inferior deest vel vix distincta, gluma superior spicula paullo brevior, 3-nervis, apice rotundata, gluma III spiculam subaequans, ovali-elliptica, obtusa, 5-nervis (vel sub-7-nervis), gluma IV spiculam aequans, subacuminata, apiculo distincte exserto, valde convexa, seriato-punctata, atropurpurea.

VENEZUELA: Biscaina prope coloniam Tovar. legit A. FENDLER no. 1740. Typus in herb. Vindebonensis sub no. 22949.

A very charateristic species of the group of the „*corynotrichae*'' all belonging to the Ternata, with densely puberulous spikelets, the short hairs capitate. In this group the species is striking by the villosity of all the vegetative parts, especially the internodes.

The only other species with such villous internodes is *D. corynotricha* (HACK.) HENR. from Brazil, a more robust perennial plant with sheaths much longer than the internodes, longer blades, about 1 cm. broad, more racemes, glabrous rhachis of the racemes and longer spikelets.

Digitaria Lehmanniana HENR. nov. spec. Annua, radicibus tenuibus; culmi cum paniculis ad 60 cm. alti, ventre valde canaliculati, erecti, graciles, vel geniculato-adscendentes, basi ramosi, paucinodes, nodis glabris, internodio summo longissimo; vaginae inferiores internodiis parum longiores, striatae, scaberulae, haud pilosae, teretiusculae vel carinatae, ligula interdum ad 2 mm. longa, vulgo 1 mm. longa, albo-fusca, glabra, apice lacera, pilis nonnullis stipata; laminae e basi subrotundato-cordata lineares, sensim acutatae, ad 6 cm. longae, ad 5 mm. latae, sed vulgo multo breviores et angustiores, nervo mediano albo crasso percursae, marginibus albis crassiusculis undulatis praeditae, pedunculus strictus, glaber; inflorescentia subpaniculata, axis communis circa 5—6 cm. longus, inferne teres,superne angulatus, glaber, racemi elegantes, inferne solitarii, superne subbinati, subaequaliter remoti, 5—8 cm. longi, superne sensim decrescentes, ad basin (praesertim inferiores) ramulosi, ramulis interdum ad 2 cm. longis, in axillis breviter pubescentes, rhachi scabra, trigona, non vel vix marginata, spiculis multo angustiore, pedicelli erecti, leviter flexuosi, scabri, triquetri, ternati vel superne binati, inferne ad basin racemorum 4—6-ni, valde inaequilongi, pedicelli longiores spiculam 2—3-plo superantes; spiculae perfecte glaberrimae, pusillae, 1.2—1.3 mm.

longae, ellipticae, gluma inferior deest, gluma superior apice subrotundata, 3-nervis, nervis infra apicem anatomosantibus, spicula distincte brevior, gluma III spiculam subaequans, subobtusa, nervis 7 subaequidistantibus praedita, gluma IV apiculata, apiculo distincte exserto, violacea, longitudinaliter lineolato-puncticulata.

COLUMBIA: Forests of highlands of Popayan, 1500—2000 m. leg. LEHMANN in 1886 sub no. B. T. 632. Typus in Herb. Lugd. Bat. sub no. 908, 349—559.

Allied to the old world *Digitaria pedicellaris,* but distinguished by the smaller glabrous spikelets, also allied to the *D. curvinervis,* an annual too, which has however a very short common axis, simple, not branched racemes and a shorter second glume. The same species was collected by Prof. L. R. PARODI in Bolivia: La Florida, Sur Yungas, 1700 m. in the year 1932 in coca plantations (Parodi no. 10058 bis).

Digitaria sabulicola HENR. nov. spec. Annua, caespitosa; culmi erecti, elegantes, circa 3-nodes, vaginae inferiores dense villosae, pilis horizontaliter patentibus, vel ad nodos reflexo-barbatae, vaginae internodiis breviores, laminae inferiores breves, planae, latae, villosae, nervo mediano albo crasso, marginibus albis undulatis vel rectis haud vel parum incrassatis, ligula scariosa, truncata, glabra, stramineo-fulva; pedunculus inflorescentiae elegans, striatus, glaber, panicula e racemis 3—4 formata, in axillis pubescens, racemi laxe floriferi, stricte erecti, rhachis anguste marginata, triquetra, scabra; spiculae binatae, pedicelli triquetri, scabri, apice subcupulati, spiculae virides, erectae, circa $2^1/_4$ mm. longae, angustae, acutae, vel leviter acuminatae, gluma inferior deest, gluma II 3-nervis spicula paulo brevior, gluma III 5- vel sub-7-nervis, nervis aequidistantibus, gluma IV pallida, acuta, leviter striolata.

Rather densely cespitose plant, forming small tufts, culms together with the panicle 30—40 cm. high, thin, rather few-noded, nodes about 3, internodes terete, the lower ones short, scarcely 1 cm. long, glabrous, gradually becoming longer, the uppermost one (peduncle) very long, exserted, the upper node below half the length of the whole plant, upper nodes glabrous; sheaths densely villous especially the lower ones, with horizontally spreading hairs or the lower nodes bearded with reflexed hairs, the minutely thickened bulbous-based hairs as long as the diameter of the sheath, the leaves thickly velvety, the hairs concealing the nerves, upper leaves becoming narrower and more glabrous, the uppermost blade only up to 1.5 cm. long and scarcely 1 mm. wide, the normal blades in the lower part of the plant about 5 cm. long and 2 mm. broad,

slightly inrolled at the top and quasi pointed or acuminate, ligule scarcely 2 mm. long, peduncle very thin, racemes up to 6 cm. long, solitary, the internodes of the panicle 5—7 mm. long, axis very narrowly winged, almost triquetrous, thin, scabrous, spikelets paired, one nearly sessile, the other pedicelled, the pedicel about 2 mm. long and triquetrous, scabrous, with a slightly discoid tip, spikelets narrowly acute, narrowed at both ends, slightly acuminate, glume I wanting or a rim only, glume II a little shorter than gl. IV, which is a little shorter than the sterile lemma, the nerves of gl. II and III are scabrous and there is a very fine pubescence along the margins of both, the fertile lemma is yellowish, acute and finely striolate.

BRASILIA: Provincia de Espiritu Santo. Voyage d'AUGUSTE DE SAINT-HILAIRE, de 1816 à 1821. Catal. B 2, 2me part. no. 369. Typus speciei in Herb. Mus. Paris.

Digitaria Petelotii HENR. nov. spec. Perennis, culmi erecto-adscendentes, vel decumbentes, ad nodos repentes, multinodes, internodiis dense pubescentibus, pedunculus glaber, nodi adpresse pubescentes; vaginae nervosae, pilis basi tuberculatis praeditae, internodiis breviores, marginibus hyalinis, ligula abbreviata, ciliolata, laminae planae, 4—5 cm. longae, 3—5 mm. latae, marginibus incrassatis, panicula e racemis 2—5 formata, rhachi distincte viridi-marginata; spiculae albo-virides, adpresse villosae, ternatae, pedicelli teretes, glaberrimi, apice cupulati, circa 2.5 mm. longae, 0.8 mm. latae, lanceolatae, gluma inferior deest, superior et gluma III aequilongae, spiculam aequantes, gl. II 3-nervis, inter nervos et versus margines sericea, gl. III 5—7-nervis, versus margines villosa, nervis subaequidistantibus, gl. IV straminea, leviter acutata, minute striolato-puncticulata.

Perennial species but with a rather faint rootstock with small villous scales at the base, decumbent, sending out long runners that root at the lower nodes, ascending upwards, 30—70 cm. long, the internodes densely pubescent, the lower ones becoming less pubescent at age, the uppermost ones glabrous, especially the peduncle which is glabrous throughout, the nodes are adpressedly rather long pubescent; sheaths strongly nerved with tubercle-based hairs between the nerves, the hairs adpressed or slightly ascending; ligule a very short ciliolate rim only, blades flat, erectly adpressed or somewhat spreading, panicle at least afterwards exserted, the racemes hairly at their insertion, about 10 cm. long, solitarily placed along a short, common, striate or grooved axis, rhachis broadly green-winged with scabrous margins, spikelets ternate, one nearly sessile,

the second with a pedicel shorter than the length of the spikelet, the third with a pedicel as long as or slightly longer than the spikelet, the pedicels nearly smooth or upwards slightly scaberulous, terete, often curved, with discoid tips; spikelets adpressed, the lower glume reduced and a rim only, the upper as long as the spikelet, 3-nerved, adpressedly hairy between the nerves and along the margins, the hairs not overtopping the spikelet, sterile lemma as long as the second glume, glabrous along the midnerve, adpressedly villous laterally and along the margins, hairs verrucose, the fertile lemma pointed, striolate-punctate.

CAMBODGE: Campong Chnang, bords des chemins, juillet 1921, leg. M. PETELOT no. 263. Typus speciei in Herb. Mus. Paris.

A beautiful species, remarkable by its tomentous internodes.

Digitaria manongarivensis A. CAMUS nov. spec. Perennis, laxe caespitosa, innovationibus extravaginalibus; culmi stricte erecti, 3—4-nodes, nodis glabris; vaginae internodiis breviores, superne hiantes, subcompressae, albo-striatae, pilis longis albis horizontaliter patentibus, basi tuberculatis dense vestitae, ligula circa 1 mm. vel paulo plus longa, scariosa, denticulata, glabra, sed pilis albis stipata; laminae anguste lineares, sensim subangustatae, marginibus sub apicem involutis et quasi setaceo-acuminatae, undique pilis vestitae, nervo mediano crasso praeditae, praesertim subtus valde prominulo, marginibus albis incrassatis vix scaberulis; pedunculus inflorescentiae longe exsertus subteres vel subcompressus, glaber, racemi circa 2 subconjugati, 7—8 cm. longi, axis triquetrus, elegans, rhachi plana, distincte viridi-marginata, laevis; spiculae ternatae, pedicelli teretes, glaberrimi, apice distincte cupulati, spiculae albo-virides, erectae, circa 2 mm. vel paulo plus longae, lanceolatae, gluma I deest, gluma II et III aequilongae, inter nervis longitudinaliter adpresse villosae, sed pilis haud excedentibus, II 3-nervis, III 7-nervis vel sub-7-nervis, gluma IV straminea, leviter striolata.

Perennial plant with slightly villous scales at the base of the culms, culms subracemose at the base, the internodes from the base to the summit of the culms gradually becoming longer, culms very elegant, about ½ mm. thick, together with the panicle about 30 cm. high, lower sheaths short, upper ones longer, about 10 cm. long, the lower ones only 4½ cm. long, those of the sterile shoots less than 4½ cm. long, blades 4—7—9 cm. long, about 2 mm. broad or a little narrower, the uppermost leaves of the culms are much reduced, about 1½ cm. long, very narrow and glabrous; racemes about 2, one sessile, the other with a 1 cm. long peduncle, insertion of the racemes pubescent or barbulate, spikelets ter-

nate or quasi alternately binate and solitary on account of the third pedicel which is adnate to the midrib, one pedicel very short, the other one longer, the third one the longest. Hairs of the spikelets verrucose.

MADAGASCAR: Herbier Perrier de La Bâthie. Prés marécageux. Manongarivo (Ambongo) Xre 1904. leg. PERRIER DE LA BÂTHIE no. 11112. Typus speciei in Herb. Mus. Paris.

Digitaria truncata HENRARD et A. CAMUS nov. spec. Perennis, longe repens, culmi ad nodos infimos bulboso-incrassati, multinodes, ibi fasciculatim ramosi, culmi fasciculorum 3—4-nodes, internodio summo longissimo; vaginae et folia glabrae, carinato-compressae, glaucescentes, angustae, circa 5 cm. longae, 1½ mm. latae, nervo mediano vix conspicuo, marginibus albis incrassatis subscaberulis, ligula glabra, circa 1 mm. longa, albo-hyalina, truncata, denticulata; pedunculus inflorescentiae teres, substriatus, glaber, racemi 3 vel 2, digitati, vel 2 sessiles, alter pedunculatus, in axillis leviter pubescentes, 5—6 cm. longi, angusti, rhachi anguste sed distincte viridi-marginata, spiculis angustiore, margine scaberula; spiculae ternatae vel superne binatae, breviter pedicellatae, adpressae, pedicelli inaequilongi, triquetri, scabri, spiculae virides, quasi glabrae, 2½ mm. longae, gluma I distincta, truncata vel emarginato-dentata, gluma II 3-nervis, spiculam aequans, quadriseriatim villosa, marginibus longiter villosis, gluma III (sterilis) spiculam aequans, 5—7-nervis, marginibus tantum villosis, gluma IV (fertilis) flavescens, leviter striolato-punctata.

A long decumbent, creeping perennial plant with a many-noded main culm, the nodes bulbous-thickened, sending out fascicles of sterile and fertile erect shoots of about 10 cm. length, the culms of the fascicles few-noded, nodes only 3—4, the uppermost internode of the fascicles long and exserted, the scales at the base of the fascicles villous; leaves glaucous or more or less violaceous upwards, at the tip somewhat inrolled and setaceously acuminate, fascicles together with the inflorescences about 30 cm. long; peduncle elegant, terete and substriate, glabrous, the 2 or 3 racemes digitate or the central one shortly peduncled, spikelets ternate, or at the top of the racemes upwards binate, the shorter pedicels half as long as the spikelets, the longer ones as long as and the longest twice as long as the flowers. The species is as to the vegetative parts very striking and the fascicles resemble those of the *Digitaria glauca*, the lower, very distinct, truncate glume and the equal glumes II and III are however very different and good characters to recognize the species.

MADAGASCAR: Bevilany (Androy), bords de l'eau, 25 mars 1924. leg.

RAYMOND DECARY no. 2455. Typus speciei in Herb. Mus. Paris.

Digitaria psammophila HENR. nov. spec. Perennis, radix crassa, culmi erecti vel erecto-adscendentes, innovationibus extravaginalibus, paucis, ad 5 cm. altis, culmi floriferi multinodes, nodis 5—6, glabris; vaginae internodiis longiores vel breviores, vaginae inferiores sparse hirsutae, vel glabrescentes, adpressae vel subhiascentes, ligula circa 2 mm. longa, alba, glabra, truncata vel fissa; laminae subglaucae, lineares, angustae, planae, sensim angustatae, vulgo 2.5 cm. longae, 2 mm. vel vix 2 mm. latae, margine albo, subincrassato, scaberulo, subundulato, multinervosae, sed nervo mediano haud conspicuo, pagina superior hinc inde pilis sparsis praedita; pedunculus elegans, erectus, teres pro ratione plantae, glaber, striatus; panicula erecta subcongesta e racemis 2—4 formata, racemi stricte digitati, a basi spiculiferi, ad insertionem leviter incrassati et puberuli, racemi 3.5—5 cm. longi, erecti, subdense spiculati, axis albus, distincte viridi-marginatus, spiculae binatae, pedicello altero subsessili, altero dimidiam spiculam aequans, pedicelli triquetri, scabri, spiculae flavo-virides vel stranineae, gluma inferior distincta, gluma II (superior) ¾ spiculam aequans, 3-nervis, inter nervos et versus margines villosula, pilis adpressis, gluma III (sterilis) spiculam aequans, 5—7-nervis, ad margines tantum villosa, gluma IV (fertilis) straminea, leviter striolata.

Perennial with a rather thick rootstock with villous scales at the base, culms with glabrous internodes, the lower sheaths longer than the internodes, the upper internodes much longer, the uppermost ones rather long with sheaths shorter than the internodes, lower sheaths sparingly hirsute, soon becoming quite glabrous, with here and there a few long hairs at the auricles or at the collar, tightly adpressed or slightly gaping at the summit, the culm-nodes perfectly glabrous, the racemes distinctly winged, the margins as broad as the whitish midrib, spikelets 2.5—2.8 mm. long, the fertile valve slightly shorter than the third glume.

MADAGASCAR: Localité Ambovombe, dans les prés sableux, 3 fév. 1931. leg. RAYMOND DECARY no. 8488. Typus speciei in Herb. Mus. Paris.

Digitaria planiculmis HENR. nov. spec. Perennis, laxe caespitosa, innovationibus extravaginalibus, culmi cum paniculis ad 80 cm. alti, ad basin dense villoso-bulboso-incrassati, stricte erecti, 7—10-nodes, nodis subaequaliter dispositis, glabris ut tota planta; vaginae compressae, striatae, internodiis breviores; internodia substriata, distincte compressa, auriculae distinctae, glabrae, ad ligulam connatae, ligula glabra, hyalina, 1 mm. longa, truncata; laminae breves, inferiores 4 cm. longae, superiores longiores, circa 7 cm. longae, e basi subcordata, 2¾—4 mm. latae, mar-

ginibus incrassatis, scaberulis, nervo mediano vix vel subtus tantum conspicuo, laminae subsetaceo-acuminatae, pallide glauco-virides, ut tota planta, pedunculus longe exsertus, compressus vel superne tantum teres, striatus, glaber; inflorescentia e racemis digitatis 3—4 formata, in axillis nigris subpubescentibus vel glabris, racemi longissimi, vulgo ad 10 cm. longi, rhachi distincte viridi-marginata, marginibus scabris, spiculis angustiore; spiculae binatae, altera breve, altera longiter pedicellata, pedicellis scabris triquetris, circa $2\frac{1}{2}$ mm. longae, lanceolatae, gluma inferior adest, gluma II (superior) quam spicula duplo brevior, 3-nervis, minute pubescens, ad margines plus minus villosa, gluma III vulgo 5-nervis, interdum sub-7-nervis, nervis validis, inaequidistantibus, tantum versus margines appresse villosa, gluma IV pallida, leviter striolato-punctata.

Culms with a thick bulbous base, densely obtected with villous scales, which become glabrous when old, nodes rather equally distributed, the uppermost internode the longest, plants nearly glabrous throughout, culms and sheaths much compressed, except the uppermost part of the peduncle, the auricles are distinct and slightly protruding, glabrous and united with the ligule, sometimes there is a single hair at the base of the blades, the latter are mostly less than 4 mm. broad. The species has somewhat the habit of *Digitaria compressa* STAPF, and agrees also in the short second glume, but STAPF's species has a fibrous coat at the base of the culms and the lower glume is wanting there.

MADAGASCAR: environs de la baie de Bombetoke, envers 1906. leg. PERRIER DE LA BÂTHIE no. 11049. Typus speciei in Herb. Mus. Paris.

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INDEX.

(Page numbers of principal entries in heavy-faced type. Synonyms in italics)

MATERIALS TOWARDS A STUDY OF THE FLORA OF THE ISLAND OF NEW GUINEA

by

H. J. LAM (Leiden).

> Quoique les données ne soient pas encore suffisantes pour pouvoir dresser une statistique de la flore de cette île et pour la comparer à celles des îles voisines, on verra ···· que l'affinité avec la flore de l'Australie n'est pas aussi grande qu'on croyait autrefois.
>
> (R. H. C. C. SCHEFFER — Ann. d. Jard. bot. de Buitenzorg I, 1876, 1).

Introduction.

It has so often been emphasized that the flora of large tropical islands like New Guinea is still very imperfect, that the impression has been established that the data available should be in a state unapt to produce a conspectus or to procure valuable conclusions. Though it is certainly true that there are still immense plots of land entirely unknown from a botanical (or any other) point of view, and that we know but a part (but most probably more than one half) of the Papuan species of *Pteridophytes* and *Spermatophytes*, I am inclined to think that it is more than anything else the scattered nature of those data, that prevented us from realizing their intrinsic value. The time has come, I think, to pauze and to realize what has been done in the past years; to arrange the many uncoördinated data in such an order that, on one hand a comprehensive view may be obtained of what has come to our knowledge and on the other hand the gaps may become apparent. In this way it may be expected beforehand, that our present knowledge, however scanty it may be, may enable us to form some provisional conclusions of not too slight an importance and of not too mean reliability. Especially as far as floristics are concerned it is obvious that, for instance, consideration of one half of a flora will lead to practically the same conclusions as the whole flora would.

In this investigation that is meant to be amplified by more detailed studies later on, I have, first of all, compiled an enumeration of the

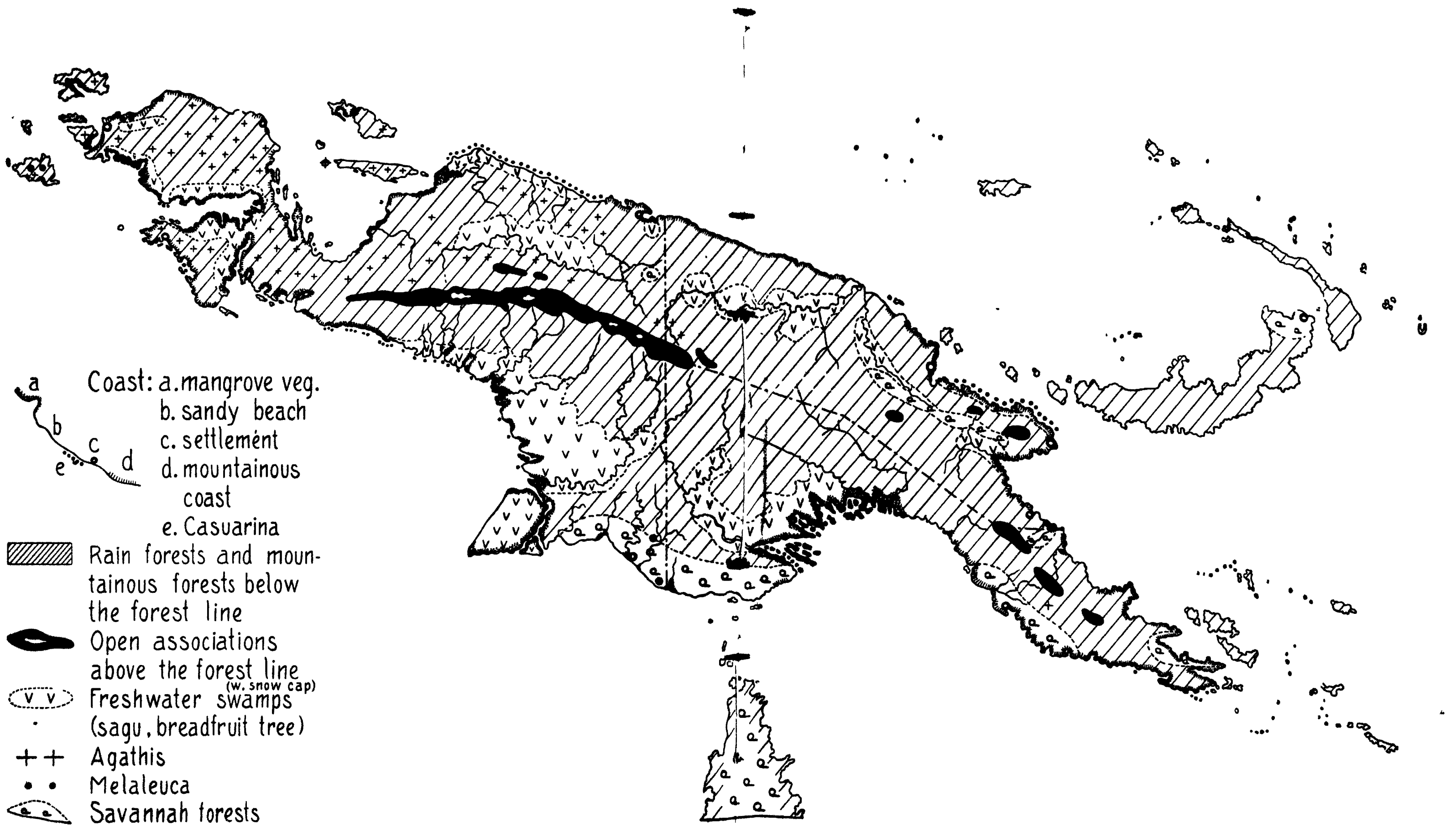

Fig. 1. Principal plant associations of New Guinea.

more important collectors and also of books and papers (cf. Annexes at the end of the present publication) which, together with the literature cited in some of them, may be considered as a basis to any student of the New Guinea flora, who desires to undertake a special investigation in this matter. As far as the facts are concerned my aims have been of a double nature; to get an impression of the principal associations of the island, and to arrange some floristic data in such a way, that they may become comparable to those of the surrounding islands and continents.

Principal associations.

From the many scattered data in the literature concerning the physiognomy of the vegetation (cf. Annex II), from my own acquaintance with the country during my visit in 1919—20 as botanist of the scientific Mamberamo Expedition and finally, from what I learnt from informations kindly given by several gentlemen [1]), many of whom are personally familiar with the country, I have tried to compile a picture of the principal associations, of their extent and their limits. These associations have roughly been drawn on the map accompanying the present paper (fig. 1). It is far from me to pretend that this map should present the associations with any degree of completeness but since a little bit is the next best to nothing, and practically nothing has been done as to mapping the vegetation of New Guinea, it may have some value as a starting point for supplementary studies.

As to the coast vegetation many details have come to my knowledge from literature, and personal informations added so many more that I could not incorporate all of them into a map of the present scale. The latter refers more especially to the Dutch part of the Island; for the Australian one I had to rely upon literature only. Next to some of the most important settlements I endeavoured to indicate whether the coast is mountainous (mostly along the N. coast and along the S.E. peninsula) or low, and if low, whether it is sandy (with *Pes caprae* and *Barringtonia*-associations and whether or not with *Casuarina equisetifolia*) or muddy (mangrove association). Small and often poor mangrove swamps occur in nearly every estuary, but extensive and fully developed

1) I have to thank the following gentlemen for their kind help: Dr C. BRAAK, H. GEURTJENS, N. HALIE, F. J. F. VAN HASSELT, Ir J. E. LOTH, Col. J. L. H. LUYMES, Prof. Dr G. L. SMIT SIBINGA, Dr J. J. SMITH, Dr C. G. G. J. VAN STEENIS and A. L. VINK.

swamps are found along the N. and NW. coast of the Gulf of Papua (Fly-river delta), from the Frederik Hendrik Island northward, along the S.E. and N. coasts of the Bomberai peninsula, the S. coast of the "Vogelkop", and the shores of the Straits of Sele. The flora of these coastal vegetations is, of course, not or hardly different from that of similar associations in this part of the world, since their elements are largely dispersed by ocean currents.

More inland by far the largest part of the island is covered by rain forest (hatched on the map). Considering the present state of exploration of the mountains I could not think of making an attempt to indicate separately the mountain forests, which, moreover, are usually not sharply distinguished from the true rain forests. I could not do more than indicate the open associations above the forest line and the small snow caps in the Dutch part, the freshwater swamps and the savannahs, and the places where two of the economically more important trees are growing aboundantly: *Agathis alba* FOXW. (*gum copal*) and *Melaleuca Leucadendron* L. (*kaju putih* or *gĕlam*). The last-named tree has a wide distribution from Australia and W. Polynesia as far as the Asiatic Continent and is cultivated in several places for its valuable oil. However, LANE-POOLE does not mention it as a useful tree in the Australian division.

While extensive plots of *Agathis alba* have been recorded from the Moluccas and the mountains of Dutch N. New Guinea as far east as Mt. Bonggo, the tree seems to be wanting or at any rate scarce in the Australian part. The record from the upper Sepik by the Dutch-German Boundary Expedition and that from the East Central Division (young specimen) by LANE-POOLE (Forest Resources, l. c., p. 167) are not fully trustworthy as the tree may be easily confounded with *Podocarpus Blumei* ENDL., especially in a young state. Moreover, the export figures for the Territories of Papua and New Guinea do not make any mention of the resin. Yet *Agathis* is represented in Australia, but it may be that the economic species (*A. alba* FOXW., and also *A. Labillardieri* WARB., the latter, for instance, from the Japen Island, Geelvinck bay) is restricted to the W. division.

Little need be said here of the freshwater swamps, which reach a pretty large extension in several spots, such as along the Fly- and Strickland rivers, in Frederik Hendrik Island, between the Central Range and the S.W. Coast, in the eastern half of the Bomberai Peninsula, around the Mac-Cluer-Gulf and Bintoeni Bay and in some inland basins

along rivers in the northern divisions (War Samsom [= Wasami], Idenburg river [Mamberamo; "Meervlakte"], Sepik and Ramu). In these parts all transitions occur between swampy forest to open water; sagu (*Metroxylon* spec.) and breadfruit tree (*Artocarpus communis* FORST. [= *incisa* L.]) are locally frequent here.

Though New Guinea is an entirely tropical island, situated but for a small part between the equator and the 10° S. parallel, there are some places where the rain forest has been replaced by associations that have often been called savannahs. It is, however, more than doubtful whether these associations are true savannahs in the sense of naturally open associations like those in N. Australia. The largest of these more or less open associations or "savannahs" are situated at the south coast, viz. between Prinses Marianne Strait and the Fly-River estuary and in the region of Port Moresby. Other places of a similar nature are found along the Goodenough Bay, near the Waria-River, the slopes S. and N. of the Finisterre Range and N. of the Bismarck Range etc., but these are either fully of anthropogenous nature or at least determined by steepness or limestone rocks.

The handbooks on ecology and plant-geography yield no or very scanty information as to the conditions of climate and soil that naturally correspond to those associations but it cannot be far from true to accept that the rainfall and particularly the distribution of the rainfall throughout the year are the main limiting factors here. It is generally accepted, that the rain forest for its full development requires a rainfall of at least 2000 (or under certain circumstances perhaps 1500) mm pro year with the condition that this amount is equally distributed over the year or nearly so. We further know, that as soon as the factor "water-supply" becomes a limiting factor the rain forest reacts by more domination of certain (tree)species of an often deciduous nature. The next phase is a deciduous monsoon-forest with only a small number of more or less dominating tree species and the next steps are the still more open savannah-forest, the "park landscape", the savannah, the steppe and the desert. As, in general, the duration of any external ecological factor is often of more importance for the determination of the vegetation and for the limitation of specific areas, than its momentary severity, it is, in the present case, more particularly the duration of the dry season (monsoon) that affects both of the features mentioned.

Unfortunately, in many parts of the Malay Archipelago the

original vegetation has been largely destroyed, and in many places the population has, moreover, the custom of annually burning the grasslands and "ladangs" (fields). Thus, it often cannot be definitely stated whether a grassland association in a region with a long dry season is natural or not.

I have therefore attempted to gather data as to the severity and duration of the dry season on one hand and the distribution of undoubtedly natural vegetations on the other. For that purpose I have accepted a method first applied, if I am well informed, by the Sugar Experiment Station at Pasoeroean, Java, which consists of mapping the areas where there are 0—5, 5—10, 10—20 or more than 20 rainy days in the driest 4 months of the year. It has been supposed that more than 20 rainy days eventually approaches the conditions under which full rain forest is possible. It needs no special mention that a low annual rainfall does not necessarily correspond to a long dry season. Thus Paloe (Mid-west Celebes at 1° S. lat.) has an annual rainfall of only 546 mm, distributed over 81.6 rainy days. Yet the driest four months of the year still have about 23 rainy days. This is probably the place with the lowest rainfall in the Malay Archipelago [1]).

On looking at the accompanying map (fig. 2) the reader may see that the regions with the best developed dry season (less than 5 rainy days in the driest 4 months) comprises, first of all, by far the greater part of N. and N.W. Australia, and further islands or N. parts of islands belonging to the group known as the Lesser Sunda Islands, including a small coastal strip of East Java and Madoera. The place with an extreme dry season in this region is, beside the desert interior of Australia, the island of Solor, E. of Flores, which has a rainfall of 891 mm pro annum with 42 rainy days. Of these

none	occur	the	driest	4	months
0.9	„	„	„	6	„
3.6	„	„	„	7	„
7.6	„	„	„	8	„

The part of Australia, shown on the map is less dry, as far as is known, having 2—4 rainy days in the driest 4 months (minimum for E. Java: 3.4).

1) Meteorological data from the publications of the „Koninkl. Magnetisch en Meteorologisch Observatorium" at Batavia (Verhandel. 18, 1924, and 23 and 24, 1931) and from informations, kindly given by Dr C. BRAAK.

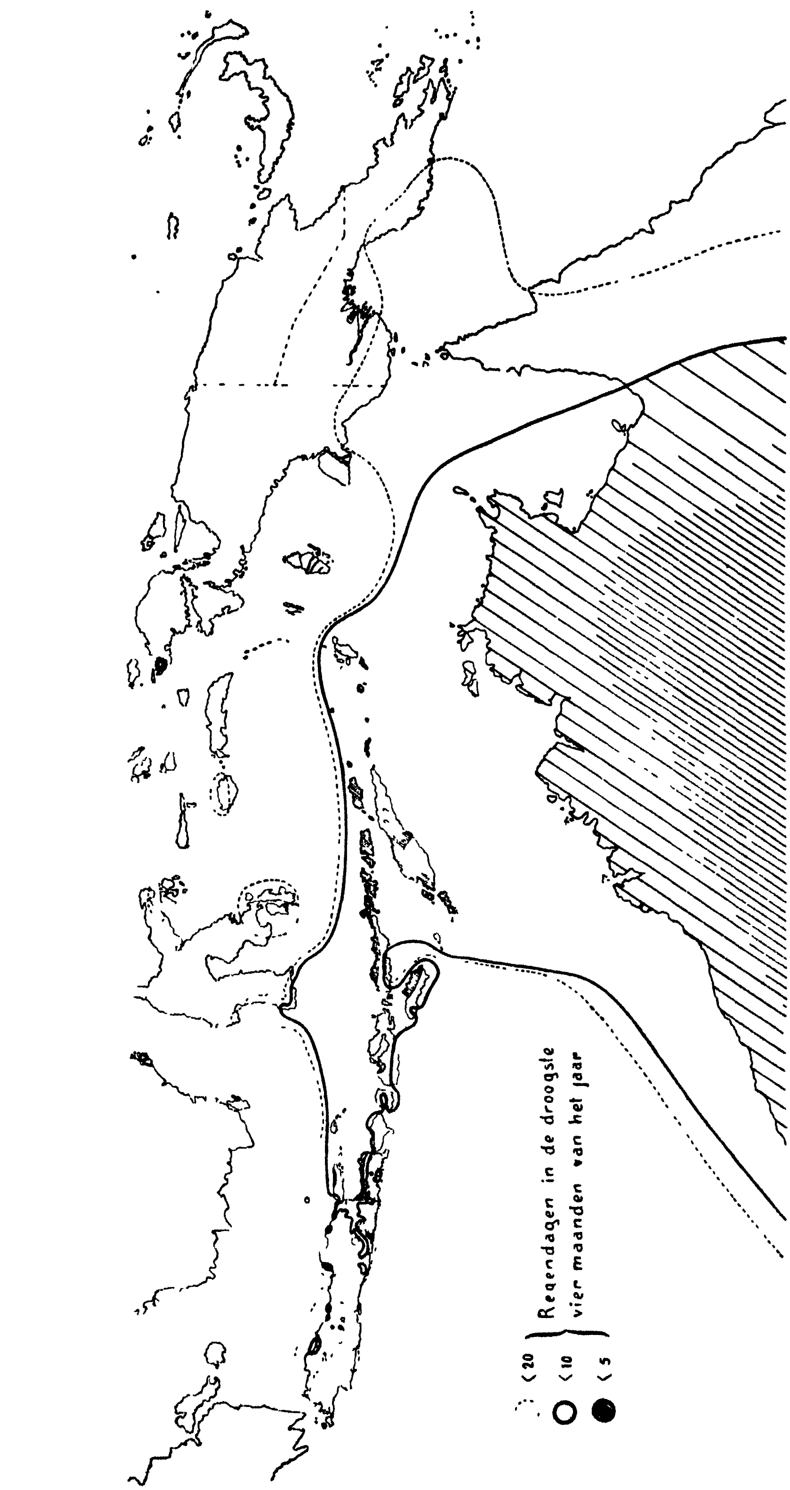

Fig. 2. Severity of the dry season in the Malay Archipelago and N. Australia, as indicated by the number of rainy days (0—5, 5—10, 10—20 or more than 20) in the driest four months of the year.

The 5—10 days line comprises the other parts of the Lesser Sunda Islands, except a small part of S.W. Flores, S.W. Soemba, S.W. Soembawa, W. Lombok and nearly the whole of Bali. The 10—20 days line includes large parts of East Java and smaller ones of W. Java (especially in the N.), further small coastal districts of S.W., S.E. and E. Celebes and N. Boeroe and finally the two larger dry areas in New Guinea, mentioned above.

The number of rainy days in the driest four months in Merauke and Port Moresby and their annual rainfall figures are:

	annual rainfall	rainy days i.t. dr. 4. m.
Merauke	1528 mm	16
Port Moresby	± 800 mm	17

Both regions perfectly agree as to this point with the western part of N. Queensland, the eastern being considerably wetter and possessing some true rain forests. This region, with 15—20 rainy days in the driest 4 months, is covered by savannah-forests as is apparent from the splendid pictures recently published by L. DIELS and E. PRITZEL (KARSTEN & WALTER, Vegetationsbilder, 24. Reihe, Heft 3, 1934, Taf. 17—18), whilst the more western parts (hatched on the map) possess a savannah or steppe vegetation.

I am inclined to conclude from these data that the Lesser Sunda Islands or at least their drier parts originally have a steppe-like vegetation, which has only little been altered by man. The more or less open associations in New Guinea, however, are of a purely anthropogenous nature as far as they are situated in the rain forest area; but those parts, lying within the 20 rainy days line originally must have had a Eucalyptus savannah-forest that has now partly been destroyed by the activities of the population. This conclusion is supported by their present flora, which consists of three distinctly distinguishable categories of elements, viz.:

1. purely Australian elements (trees such as *Eucalyptus, Melaleuca, Cycas*, some *Proteaceae, Acacia*, etc.).

2. trees that are common to other open associations whether natural or anthropogenous, mostly with wide distribution also in the western part of the Archipelago (*Alstonia scholaris* R.BR., *Albizzia procera* BENTH., *Gossampinus heptaphylla* [HOUTT.] BAKH., *Garuga floribunda* DECNE., etc.).

3. herbs and other plants, which endure or survive the annual

burning, especially grasses (many species, among which the deep-rooting *alang-alang, Imperata cylindrica* BEAUV., var. *Koenigii* BENTH., or *Apluda*-species prevail), *Liliaceae* (with subterraneous bulbs), in wet places also *Drosera* (Australian!).

Floristics.

While the vegetation is mainly a function of the external factors and only in the second place of time, the last-named factor plays a prominent part regarding the flora. In general, one may say that the flora of a country consists of three categories of elements, that meanwhile are not sharply distinguishable:

1. relic-endemisms, being the progeny of unknown elements or of plants that have immigrated a long time ago;
2. neo-endemisms, being the offspring of plants which have immigrated in more recent times;
3. recent immigrants, which have not or not yet had the opportunity or the time to raise new species and for which the country thus forms a part of their area.

Time and immigration possibilities are therefore the main factors that determine a flora; ecological conditions, however important and selective they may be, are second in rank.

With appropriate observance of specific modes of dispersion and of relative differentiation, important conclusions may be drawn as to whether land connections with certain other lands, if any, are of old date or not. As regards New Guinea, conclusions of this nature may be of extreme importance since they may, in connection with data yielded by zoogeography and geology, procure indications as to which conception should be accepted for this part of the world: the old theory of the permanency of oceans and continents, or WEGENER's hypothesis of continental shift. In order to get a provisional idea of whether the New Guinea flora even when only partially investigated, may procure any data for conclusions of this kind, I have compiled some floristic data, that may follow here; these data have been laid down in six lists, viz.:

I Relation of families, genera and species;
II Endemism of genera and species;
III Endemic genera;
IV Some subendemic genera;
V Groups with strong differentiation;
VI Geographic relations.

TABLE I.

RELATION OF FAMILIES, GENERA AND SPECIES.

Data mostly taken from LAUTERBACH's Beiträge zur Flora von Papuasien; cases in which „Nova Guinea'' has been consulted, have been indicated with an asterisk; if other publications have been used, they have been quoted. Only the families have been mentioned, that are in some way pertinent to our purpose.

	Fam.	*Number of Genera*	*Number of Species*
	Acanthaceae	21	55
	Amaryllidaceae	4	8
	Anacardiaceae	12	47
	Anonaceae	18	84
5	Apocynaceae	29	88
	Aquifoliaceae (Journ. of Bot. 61, 1923, Suppl. 10)	1	5
	Araliaceae	13	85
	Aristolochiaceae	1	15
	Balsaminaceae	1	8
10	Bignoniaceae	4	26
	Burseraceae (Bull. J. bot. Btzg 1932)	5	30
	Campanulaceae	5	6
	Capparidaceae	4	10
	Clethraceae (Kew Bull. 1899, 126)	1	1
15	Commelinaceae	6	20
	Compositae	48	69
	Connaraceae	2	4
	Cornaceae (Blumea, 1934)	2	3
	Cruciferae	2	5
20	Cucurbitaceae	16	37
	Cunoniaceae	11	30
	Dichapetalaceae	1	11
	Dilleniaceae	3	61
	Elaeocarpaceae	6	92
25	*Ericaceae	7	179
	Flagellariaceae	2	3
	Gentianaceae	4	11
	Gesneraceae	12	180
	Gnetaceae	1	5
30	Guttiferae	9	67
	Halorrhagaceae	2	9
	*Icacinaceae	14	47
	Labiatae	10	19
	Lauraceae	10	91
35	Lecythidaceae	3	21
	Leguminosae (Mimos. and Caesalp.)	16	73
	Lentibulariaceae	1	4
	Liliaceae	12	53
	Linaceae	1	3
40	Loganiaceae	7	44
	Lythraceae	3	7
	Melastomaceae	21	118
	Menispermaceae	7	56
	Monimiaceae	10	60
45	Myricaceae	1	1
	*Myrtaceae	20	172
	Olacaceae	4	24
	Oleaceae	4	24
	Opiliaceae	3	3
50	Orchidaceae (Rogers 1932)	116	2546
	Palmae	33	125
	Pinaceae	3	7

	Fam.	*Number of Genera*	*Number of Species*		*Fam.*	*Number of Genera*	*Number of Species*
	Pittosporaceae	1	3	65	Stemonaceae	1	2
	Pteridophyta	87	970		Sterculiaceae	11	31
55	Quercus (s.a.)	4	17		*Symplocaceae	1	30
	Rhamnaceae	8	14		Taxaceae	3	11
	Rubiaceae	47	378		Ternstroemiaceae	4	8
	Rutaceae	18	82	70	Ulmaceae	4	12
	Santalaceae	3	14		*Urticaceae	13	128
60	Sapindaceae	25	117		Violaceae	3	8
	*Sapotaceae	11	47		Vitaceae	4	56
	Saxifragaceae	7	30	74	Zingiberaceae	13	150
	Scrophulariaceae	10	28				
	Simarubaceae	5	5			834	6872

From these figures may be concluded that there are, in average:

92.7 species pro family — (80.8 } without Pteridophyta)
11.35 genera pro family — (10.23 }
8.16 species pro genus: (without Pteridophyta: 7.9; without Pteridophyta and Orchidaceae: 5.32)

TABLE II.

ENDEMISM OF GENERA AND SPECIES.

Mostly taken from LAUTERBACH's Beiträge zur Flora von Papuasien, sometimes amplified with data from „Nova Guinea'' or other newer publications.

Area: Mainland of New Guinea with the Louisiades, the Bismarck Archipelago, the Admiralty Islands and the islands in the Geelvink bay, however, without the Aru and Kai Islands.

Subendemic means: with the bulk of the species in New Guinea and only one or very few outside the area.

		Number of genera total	*Number of genera endemic (subendemic)*	*Number of species total*	*Number of species endemic*
	Acanthaceae	21	4	55	32
	Amaryllidaceae	4	—	8	2
	Anacardiaceae	12	2	47	30
	Anonaceae	18	4(1)		
5	Apocynaceae	29	6(2)	88	55
	Aquifoliaceae	1	—	4	2

		Number of genera total	Number of genera endemic (subendemic)	Number of species total	Number of species endemic
	Araliaceae	13	1	85	78
	Aristolochiaceae	1	—	15	10
	Burseraceae	5	—(1)	30	22
10	Campanulaceae	5	1	6	4
	Capparidaceae	4	—	10	2
	Commelinaceae	6	—	20	5
	Compositae	48	3	69	43
	Connaraceae	2	—	4	3
15	Cornaceae	2	1	3	1
	Cucurbitaceae	16	–	37	10
	Dichapetalaceae	1	—	11	11
	Elaeocarpaceae	6	2		
	Ericaceae	7	1		
20	Flagellariaceae	2	—	3	—
	Gentianaceae	4	—	11	9
	Gesneraceae	12	4(2)	180	179
	Gnetaceae	1	—	5	—
	Guttiferae	9	4	67	62
25	Halorrhagaceae	2	—	9	6
	Icacinaceae	14	3(1)		
	Lauraceae	10	1		
	Lecythidaceae	3	—	21	15
	Leguminosae				
	Mimosaceae	8	1(2)	35	22
	Caesalpiniaceae	8	1	28	18
30	Liliaceae	12	—	53	29
	Linaceae	1	—	3	3
	Lythraceae	3	—	6	2
	Melastomaceae	21	5	118	110
	Menispermaceae	7	1		
35	Monimiaceae	10	3		
	Myricaceae	1	—	1	—
	Myrtaceae	20	2		
	Olacaceae	3	—	3	1
	Oleaceae	4	—	24	19
40	Opiliaceae	3	1	3	1

		Number of genera		*Number of species*	
		total	*endemic (subendemic)*	*total*	*endemic*
	Orchidaceae (1934) ...	116	8(10)	2546	2534
	Palmae	33	2(2)	125	115
	Pittosporaceae	1	—	3	1
	Pteridophyta			970	597
45	Quercus (s.a.)	4	--	17	12
	Rhamnaceae	8	—	14	7
	Rubiaceae	47	5		
	Rubus	1	—	9	5
	Rutaceae	18	4	82	68
50	Santalaceae	3	—	14	13
	Sapindaceae	25	1	117	91
	Sapotaceae	11	1	47	35
	Saxifragaceae	7	2(1)	30	30
	Scrophulariaceae	10	1	28	8
55	Stemonaceae	1	—	2	2
	Symplocaceae	1	—	21	21
	Taxaceae	3	—	11	4
	Ulmaceae	4	—	12	7
	Urticaceae	13	1	121	95
60	Violaceae	3	—	8	7
	Vitaceae	4	—	56	34
	Zingiberaceae	13	2(2)	150	140
	Fam. uncertain (Gertrudia, Marumia Warburgii)	2	2	2	2
		687	81(25)	5446	4614
		61 fam.		53 fam.	

Therefore the generic endemism is 11.6 (15.3 [1])) %
the specific endemism: 84.7 %.

1) Subendemics calculated as one half.

TABLE III.

ENDEMIC GENERA ARE (those [16] names, marked with a W, have survived from WARBURG's list of 1891):

Acanthaceae — Ancylacanthus LINDAU; Calycacanthus K. SCHUMANN (W); Gymnophragma LINDAU; Jadunia LINDAU.

Anacardiaceae — Nothopegiopsis LAUTERBACH; Skoliostigma LAUTERBACH.

Anonaceae — Oncodostigma DIELS; Oreomitra DIELS; Petalo(lo)phus K. SCHUMANN; Schefferomitra DIELS.

Apocynaceae — Delphyodon K. SCHUMANN; Discalyxia MARKGRAF; Kentrochosia LAUTERBACH & SCHUMANN; Lamechites MARKGRAF; Papuechites MARKGRAF; Pseudowillughbeia MARKGRAF.

Araceae — Diandriella ENGLER; Holochlamys ENGLER (W); Xenophya SCHOTT (W).

Araliaceae — Palmervandenbroekia GIBBS; Peekeliopanax HARMS (N. Brit.).

Asclepiadaceae — Astelma SCHLECHTER; Spathidolepis SCHLECHTER.

Bignoniaceae — Neosepicaea DIELS.

Boraginaceae — Crucicaryum BRAND.

Campanulaceae — Phyllocharis DIELS.

Compositae — Branchionostylum MATTFELD; Hecatactis F. v. MUELLER; Ischnea F. v. MUELLER (W).

Cornaceae — Mastixiodendron MELCHIOR.

Corsiaceae — Corsia BECCARI (W).

Cruciferae — Papuzilla RIDLEY.

Cunoniaceae — Aistopetalum SCHLECHTER; Kaernbachia SCHLECHTER; Opocunonia SCHLECHTER; Stollaea SCHLECHTER.

Cyperaceae — Capitularia SURINGAR.

Elaeocarpaceae — Anoniodes SCHLECHTER; Sericolea SCHLECHTER.

Epacridaceae — Decatoca F. v. MUELLER (W).

Ericaceae — Disiphon SCHLECHTER.

Euphorbiaceae — Syndyophyllum LAUTERBACH & SCHUMANN; Tetraglochidion SCHUMANN.

Gesneraceae — Cyrtandropsis LAUTERBACH; Euthamnis SCHLECHTER; Oxychlamys SCHLECHTER; Sepikea SCHLECHTER.

Gramineae — Buergersiochloa PILGER.

Guttiferae — Cyclandra LAUTERBACH; Nouhuysia LAUTERBACH; Tetrathalamus LAUTERBACH; Tripetalum SCHUMANN (W).

Icacinaceae — Leucocorema RIDLEY; Pentastira RIDLEY; Pocillaria RIDLEY.

Lauraceae — Pseudocryptocarya TESCHNER.

Leguminosae — Schleinitzia WARBURG (W); Schizoscyphus SCHUMANN (W).

Loganiaceae — Dolianthus C. H. WRIGHT.

Loranthaceae — Dactyliophora van TIEGHEM; Distrianthes DANSER; Papuanthes DANSER; Rhizomonanthes DANSER; Sogerianthe DANSER; Tetradyas DANSER.

Malvaceae — Wilhelminia HOCHREUTINER.

Melastomaceae — Bammlera LAUTERBACH & SCHUMANN; Catanthera F. v. MUELLER; Phyllapophysis MANSFELD; Poikilogyne GIBBS; Scrobicularia MANSFELD.

Menispermaceae — Macrococculus BECCARI (W).

Monimiaceae — Anthobembix PERKINS; Idenburgia GIBBS; Lauterbachia PERKINS.

Moraceae — Antiaropsis SCHUMANN (W); Dammaropsis WARBURG (W).

Myrtaceae — Octamyrtus DIELS; Xenodendron LAUTERBACH & SCHUMANN.

Opiliaceae — Gjellerupia LAUTERBACH.

Orchidaceae — Chitonanthera SCHLECHTER; Dryadorchis SCHLECHTER; Eurycentrum SCHLECHTER; Ischnocentrum SCHLECHTER; Papuaea SCHLECHTER; Porphyrodesme SCHLECHTER; Ridleyella SCHLECHTER; Sepalosiphon SCHLECHTER.

Palmae — Leptophoenix BECCARI; Sommieria BECCARI (W).

Passifloraceae — Hollrungia SCHUMANN (W).

Proteaceae — Finschia WARBURG (W).

Rubiaceae — Airosperma LAUTERBACH & SCHUMANN; Maschalodesme LAUTERBACH & SCHUMANN; Myrmedoma BECCARI (W); Siphonandrium SCHUMANN; Versteegia VALETON.

Rutaceae — Hormopetalum LAUTERBACH; Hunsteinia LAUTERBACH; Lamiofrutex LAUTERBACH; Terminthodia RIDLEY.

Sapindaceae — Mischocodon RADLKOFER.

Sapotaceae — Krausella H. J. LAM.

Saxifragaceae — Discogyne SCHLECHTER; Kania SCHLECHTER.

Scrophulariaceae — Detzneria SCHLECHTER.

Urticaceae — Gibbsia RENDLE.

Zingiberaceae — Eriolopha RIDLEY; Thylacophora RIDLEY.

Fam. uncertain — Gertrudia SCHUMANN.

Total number: 110.

Doubtful:

?Geitroa BECCARI (W) cf. WARBURG, ENGL. BOT. JAHRB. **13**, 1891, 231.
?Marumia Warburgii COGN., cf. ENGL. BOT. JAHRB. **60**, 1926, 114.

Endemic Sections:

Dendrobium SCHWARTZ Sect. Amblyanthus.
„ Herpetophytum.
Glomera SCHLECHTER „ Giulianettia.

TABLE IV.

SOME SUBENDEMIC GENERA ARE:

Anonaceae — Papualthia DIELS (also in the Philippine Isl.).
Apocynaceae — Excavatia MARKGRAF (also 1 species in Kai): Lepiniopsis VALETON (also some species in the Phil., Mol., Polyn.).
Araliaceae — Anomopanax HARMS (also in the Phil.).
Burseraceae — Haplolobus H. J. LAM (10 species in N. G., 1 in Amboina, 1 in N. Borneo).
Cunoniaceae — Betchea SCHLECHTER (also in Australia).
Ericaceae — Dimorphanthera F. v. MUELLER (30 sp. in N. G., 1 in Amboina, 2 in the Phil., also in Fiji); Paphia SEEM. (also in Fiji).
Euphorbiaceae — Endospermum BENTHAM (E. formicarum BECCARI; also in Mol.).
Fungi — Echinophallus HENNINGS (E. Lauterbachii HENNINGS; also in Morotai).
Gesneraceae — Boea COMMERSON (some sp. in the W. part of the Archipelago); Dichrotrichum REINWARDT (30 sp. out of 33 [western]).
Himantandraceae — Himantandra F. v. MUELL. (also in Batjan and N.E. Australia).
Icacinaceae — Rhiti(do)caryum BECCARI (18 sp. N. G., 1 sp. Kai).
Leguminosae — Archidendron (Hansemannia incl.) F. v MUELLER (also some sp. in Austr. and Polyn.); Maniltoa SCHEFFER (also sp. in Polyn.).
Menispermaceae — Albertisia BECCARI (monotypic, also in Boeroe).
Monimiaceae — Levieria BECCARI (also in Queensl. and Mol.); Steganthera PERKINS (18 spec. N. G., 1 sp. Celebes).
Moraceae — Pseudotrophis WARBURG (also 1 spec. in the Phil.).
Myrtaceae — Xanthomyrtus DIELS (also N. Caled., N.E. Austr. and N. Borneo).

Ochnaceae — Schuurmansia BLUME (also in the Mol. and Borneo).
Orchidaceae — Aglossorhyncha SCHLECHTER (also 1 sp. in Seran); Calymmanthera SCHLECHTER (also 1 sp. in Morotai); Corysanthes R. BROWN (Corybas SALISBURY) (also in Austr., some sp. in W. part of Mal. Archip.); Epiblastus SCHLECHTER (also in Samoa, Cel. and Mol.); Hymenorchis SCHLECHTER (also 1 spec. in Java); Mediocalcar J. J. SMITH (also some sp. in Celeb.); Microtatorchis SCHLECHTER (also some sp. out of N. G.); Pedilochilus SCHLECHTER (also 1 sp. in Celeb.).
Rubiaceae — Amaracarpus BLUME? (also in Western parts of Mal. Arch. and in the Phil.).
Sapotaceae — Burckella PIERRE (also some sp. in Mol. and Polyn.).
Saxifragaceae — Carpodetus FORSTER (also 1 sp. N. Zealand).
Umbelliferae — Didiscus DE CANDOLLE (also in Austr. and N. Borneo).
Verbenaceae — Faradaya F. v. MUELLER (1 spec. also in Queensl. and Borneo and 1 also in Seran).
Zingiberaceae — Riedelia OLIVER? (also in Western parts of Mal. Arch.); Tapeinochilus MIQUEL (also in Mol. and Austr.).

Sections:

Orchidaceae — Bulbophyllum THOUARS Sect. Coelochilus; Sect. Dialeipanthe; Sect. Hyalosema; Sect. Macrouris; Sect. Pelma; Sect. Polyblepharon.
Dendrobium SCHWARTZ Sect. Calyptrochilus; Sect. Ceratolobium; Sect. Latouria; Sect. Oxyglossum.
Urticaceae — Conocephalus BLUME Sect. Poikilospermum.

TABLE V.

GROUPS WITH STRONG DIFFERENTIATION.

Ericaceae — Rhododendron (± 80 spec.), Vaccinium (± 60 spec.).
Myrtaceae — Xanthomyrtus; Decaspermum; Syzygium.
Orchidaceae — abt. 2550 spec. in 116 genera.
Pteridophyta — abt. 1000 spec. in 87 genera.
Rubiaceae — abt. 380 spec. in 47 genera (especially: Ophiorrhiza, Argostemma, Urophyllum, Randia, Hydnophytum, Psychotria, Timonius).
Araliaceae — Boerlagiodendron.
Asclepiadaceae — Hoya (> 50 spec.).
Bignoniaceae — Deplanchea; Pandorea; Tecomanthe.
Burseraceae — Canarium.

Coniferae — Libocedrus.
Corsiaceae — 1 genus in N. G. (Corsia), 1 in Chile.
Cunoniaceae — Gilbeea; Pullea (also in Australia).
Dilleniaceae — Saurauia.
Elaeocarpaceae — Elaeocarpus.
Epacridaceae — Styphelia.
Gesneraceae — Aeschynanthus (= Trichosporum) (33 spec. out of ± 100); Cyrtandra (95 spec.).
Magnoliaceae — Drimys.
Melastomaceae — Medinilla (56 spec.).
Monimiaceae — Trimenia.
Myrtaceae — Backhousia (also in Australia).
Orchidaceae — Bulbophyllum (± 550 spec. in N. G.); Caladenia (74 spec. in N. G.); Dendrobium (± 575 spec. in N. G.); Liparis (> 100 spec. in N. G.); Microstylis (> 100 spec. in N. G.); Oberonia (> 100 spec. in N. G.); Phreatia (± 123 spec. in N. G.); Prasophyllum (72 spec. in N. G.); Pterostylis (64 spec. in N. G.); Taeniophyllum (> 100 sp. in N. G.); Thelymitra (49 sp. in N. G.).
Palmae — Drymophloeus.
Pandanaceae — Freycinetia; Pandanus.
Pteridophyta — Alsophila; Asplenium; Cyathea; Dryopteris, Polypodium; Selaginella; Trichomanes.
Sapotaceae — Planchonella.
Sterculiaceae — Sterculia.
Triuridaceae — Sciaphila.
Urticaceae — Cypholophus; Elatostema; Pilea.
Zingiberaceae — Alpinia.

Sections:

Orchidaceae — Dendrobium Sect. Diplocaulobium; Sect. Grostidium.

TABLE VI.

GEOGRAPHIC RELATIONS.

1. Asiatic and Malaysian Elements (those provided with an asterisk reach the eastern limit of their area in New Guinea).

Families:

*Ericaceae, abundant in New Guinea, practically wanting in Australia and Polynesia.

***Balsaminaceae**
Gesneraceae
Lauraceae
***Myricaceae**
Oleaceae
Ulmaceae, etc.
Genera:
Aquifoliaceae — Ilex.
Begoniaceae — *Begonia.
Bombacaceae — Gossampinus.
Borraginaceae — Cynoglossum (the New Guinea species, however, more related to Australian types?).
Burseraceae — Canarium; Garuga, *Santiria.
Campanulaceae — *Pentaphragma.
Combretaceae — Combretum; Terminalia.
Compositae — *Lactuca.
Dipterocarpaceae — *Anisoptera; Hopea; *Vatica.
Elaeocarpaceae — Elaeocarpus.
Ericaceae — Rhododendron; *Vaccinium.
Euphorbiaceae — Homalanthus.
Fagaceae — *Castanopsis; *Quercus s.a. (not in Australia, extant in Polynesia).
Gentianaceae — *Gentiana.
Gesneraceae — *Aeschynanthus (= Trichosporum); *Dichrotrichum.
Gonystylaceae — *Gonystylus.
Lauraceae — Litsea.
Lentibulariaceae — Utricularia.
Loranthaceae — *Macrosolen.
Monimiaceae — *Kibara.
Myrsinaceae — *Labisia.
Myrtaceae — Decaspermum; Syzygium.
Nepenthaceae — Nepenthes.
Orchidaceae — Bulbophyllum; Dendrobium; Habenaria; Peristylus; Phreatia; Spathoglottis.
Ranunculaceae — Ranunculus; *Thalictrum.
Rosaceae — *Potentilla; Rubus.
Rubiaceae — *Amaracarpus; Argostemma; Timonius.
Rutaceae — Acronychia; Atalantia; Evodia; Lunasia; Luvunga.
Santalaceae — Henslowia.

Saxifragaceae — *Astilbe; *Dichroa; Polyosma.
Sterculiaceae — Firmiana; *Pterocymbium; Sterculia.
Styracaceae — *Bruinsmia; *Styrax.
Symplocaceae — *Cordyloblaste; Symplocos.
Taxaceae — Podocarpus.
Ternstroemiaceae — *Adinandra; Eurya; Ternstroemia.
Urticaceae — Elatostema; Pilea.
Valerianaceae — *Triplostegia.
Verbenaceae — *Teysmanniodendron.
Violaceae — Viola.

2. Polynesian Elements (an asterisk indicates that the western limit of the area is reached in New Guinea):

Araliaceae — Meryta (also New Caledonia); Plerandra; Tetraplasandra.
Apocynaceae — Clitandropsis.
Many Compositae.
Corynocarpaceae — *Corynocarpus.
Cunoniaceae — Spiraeanthemum.
Elaeocarpaceae — Antholoma (also New Caledonia).
Guttiferae — Penthaphalangium.
Myrtaceae — Mearnsia (also 1 species Philippines); *Xanthomyrtus (also New Caledonia).
Nepenthaceae — Nepenthes Vieillardii (also New Caledonia).
Pandanaceae — *Sararanga.
Santalaceae — Santalum.
Sapindaceae — Euphorianthus; Harpullia; Jagera; Tristiropsis.
Sapotaceae — Achradotypus.
Violaceae — *Agatea (also New Caledonia).

3. Antarctic Elements (an asterisk indicates that the western limit of the area is reached in New Guinea; in general Southern Hemisphere, S. America inclusive):

*Corsiaceae (1 genus in New Guinea, 1 genus in S. America).
Cochlospermaceae — *Cochlospermum.
Compositae — Abrotanella.
Cruciferae — Papuzilla (endemic, but related with types of the Southern Hemisphere).
Cyperaceae — *Carpha.
Cupressaceae — Libocedrus (circumpacific; in the Malay Archipelago in Batjan only).

Droseraceae — Drosera (many in Australia).
Epacridaceae — Styphelia (as far West as Java).
Halorrhagaceae — Gunnera; Halorrhagis.
Iridaceae — *Libertia.
Liliaceae — *Astelia alpina; some Luzuriagoideae.
Magnoliaceae — Drimys (1 species in Borneo and Philipp.).
Orchidaceae — Glomera (circumpacific).
Oxalidaceae — Oxalis.
Pinaceae — *Araucaria.
Pittosporaceae — Pittosporum.
Polygonaceae — *Muehlenbeckia.
Rosaceae — *Acaena.
Sapotaceae — Lucuma (circumpacific).
Saxifragaceae — *Carpodetus (New Zealand).
Scrophulariaceae — Hebe (N. Zealand, S. America).
Thymelaeaceae — Kelleria (= Drapetes) 3 species in New Zealand, 2 in New Guinea, 1 in N. Borneo, 1 in S. Australia and Tasmania.

4. Australian Elements (an asterisk indicates that the northern limit of the area is reached in New Guinea):

Proteaceae.
Araliaceae — Boerlagiodendron; Kissodendron; Mackinleya.
Casuarinaceae — Casuarina.
Centrolepidaceae — Centrolepsis.
Compositae — Brachycome; *Olearia; *Tetramolopium; Vittadinia.
Cunoniaceae — *Betchea; *Gilbeea; *Pullea.
Cyperaceae — Cladium (as far West as the Philipp.); Gahnia; Schoenus (as far West as the Philipp.).
Dilleniaceae — *Hibbertia (also in New Caledonia).
Epacridaceae — Styphelia (240 species in Australia and S. America, some as far as the W. Archipelago).
*Eupomatiaceae — *Eupomatia.
Goodeniaceae — Scaevola.
Gramineae — Danthonia; *Ectrosia leporina; Monostachya.
Haemodoraceae — *Haemodorum.
Iridaceae — Patersonia (also N. Borneo).
Liliaceae — Arthropodium; *Lomandra; Schelhammera and other genera.
Menispermaceae — Carronia.
Monimiaceae — Daphnandra; *Palmeria; *Piptocalyx.

Myrtaceae — *Backhousia; Eucalyptus (as far West as Timor and Celebes); Melaleuca.
Orchidaceae — Caladenia; Corysanthes (= Corybas); Microtis; *Pterostylus; Thelymitra (as far West as Java).
Palmae — *Bacularia; *Hydriastele; *Kentia; *Linospadix.
Philydraceae — Helmholtzia.
Pinaceae — Callitris s. s.
Proteaceae — *Banksia; *Grevillea; *Stenocarpus (also in New Caledonia and N. Australia).
Rubiaceae — Coprosma (some species as far West as the W. Archipelago).
Santalaceae — Exocarpus (14 species in Australia; some as far West as the W. Archipelago and the Philipp.).
Sapindaceae — Dodonaea.
Saxifragaceae — Quintinia (1 species in the Philipp.).
Scrophulariaceae — Euphrasia.
Sterculiaceae — *Brachychiton.
Stackhousiaceae — Stackhousia.
Stylidiaceae — Stylidium.
Taxaceae — Dacrydium (as far as the W. Archipelago); Phyllocladus (as far as N. Borneo, the Philipp. and Celebes).
Umbelliferae — Didiscus (also N. Borneo); Oreomyrrhis.
Orchidaceae — Dendrobium Sect. Rhizobium.

From these statements we may notice the following points:

1. The *strong differentiation* appearing from the high figure for species pro genus and pro family and genera pro family (Table I). If we compare them with the corresponding figures for Borneo [1]), an island of a quite diametrically different geological history but of almost the same area, we get the following statement (*Spermatophytes* only):

	New Guinea	Borneo
area in km^2	± 800.000	± 750.000
nr. of spec. pro fam.	80.80	32.00
„ „ gen. „ „	10.23	7.32
„ „ spec. „ genus	7.90	4.34

1) E. D. MERRILL, Enum. Born. Pl. — Journ. Str. Br., Roy. As. Soc., Spec. Numb. Sept. 1921.

This means that the development of what we have to consider as the younger elements (species) has been much stronger in New Guinea than in Borneo (proportion concerning species pro family 80.80 : 32.00 = 2.52; concerning species pro genus 7.90 : 4.34 = 1.82). The difference on the development of older units (genera) is less (proportion concerning genera pro family 10.23 : 7.32 = 1.4), though it is obvious that also the genera have taken part in the differentiation. The flora of Borneo, that has to be considered as a part of the Asiatic Continent (cf. LAM, l. c., 1929 and 1930) thus appears to be less differentiated than that of New Guinea and the difference is greatest in the younger (2.52 : 1), smallest concerning the older units (1.4 : 1). It must therefore be concluded that the flora of Borneo is older than that of New Guinea, since we may suppose that the differentiation affects the youngest units only, while the older ones get their differentiation indirectly, viz. by natural elimination of individuals, forms, etc. between the concentration points of individuals that form the species. Thus the discontinuity between groups of individuals become more distinct as these groups grow older and a flora which for a great deal consists of young and strongly differentiated units with close mutual relations must therefore, as a whole, be younger than a flora with less differentiation and more evident discontinuity between the groups.

2. This point leads us to the *endemism* factor. It is generally believed that as the discontinuity between endemic units and their nearest relations is greater, the flora as a whole is older. Now the New Guinea flora (Tables II, III, IV) possesses not a single endemic family, while Australia, with which the island forms a geological unit, has several endemic families (*Cephalotaceae*, *Tremandraceae*, *Brunoniaceae*, etc.) and many subendemic ones. The number of younger endemic elements, however, is great. Compared with Borneo these figures are:

	New Guinea	Borneo
Generic endemism	11.6 %	4.1 %
Specific endemism	84.7 %	49.0 %

Moreover it appeared to me that of the New Guinea endemic genera none (as far as I know) is very much different from its relations and many are pretty closely allied to their nearest relations. Though there are some 110 genera known at present to be endemic in New Guinea, this endemism must therefore be relatively young. This conclusion is supported by the high specific endemism figure. Conclusions

concerning this have, however, to be treated with the utmost care and criticism, because the endemism figure is also dependent upon land connections and emigration possibilities. This is also the reason why the endemisms of New Guinea and Borneo cannot be compared like the relations of families, genera and species, since the land connections may have been (and possibly actually have been) entirely different both in time and in age. At any rate, we may state that there are no old relic-endemics (as far as I know) and that, therefore, the endemic elements must have originated in relatively recent times (neo-endemics). It is my impression that the process of differentiation is still going on vigorously after the island has been severed from surrounding landmasses. Apparently New Guinea has, in a relatively recent time, become a centre of dispersion as has been remarked before by several authors (COPELAND, SCHLECHTER, etc.). Yet some units have got the opportunity of spreading and settling in regions outside the island. I have enumerated some of these in Table IV. As far as relations to Australia are concerned, it may in some cases be difficult to discriminate whether a genus has originated in New Guinea or in the Australian Continent, but in most other cases it may be readily accepted that New Guinea has been the birthplace, also of many species or genera that are now found in New Guinea and in Australia only. Such units could be called "secondarily Australian".

It hardly needs to be mentioned that the endemism figure increases at higher altitudes. This is a phenomenon of general validity, probably due to the presence of more pronounced barriers and the strong variation of external factors in relatively small areas. As in many other mountain ranges some plant families have separate species on almost every peak (*Orchidaceae, Ericaceae, Gesneraceae,* etc.) and it cannot be explained by a general rule why other mountain species have so wide a distribution (cf. GIBBS, l. c.). Thus the endemism figure for the flora of the "Sattelberg" [1]) was between

100— 700 m: 41 %
700—1000 m: 70 %

On examining the *Compositae*, it is striking that of the 25 lowland species there is only one endemic, while there are 42 among the 44 mountain species. In general the endemism of Papuan subalpine species must be something like 90 %; in Java it is only 30 % [1]).

1) TH. SCHMUCKER, Beiträge z. Kenntn. der Hochgebirgsflora Javas und zur Theorie der Pflanzenausbreitung. — Beih. Bot. Centralbl. XLIII, 1927, 34–68, 5 figs.

3. The third point concerns the *relations* of *neo-endemics* and *recent immigrants*. It has, since the times of WALLACE's book (The Malay Archipelago, etc. 1864), often been said that the Australian element in the Papuan flora should be very considerable; in more recent times, however, a closer investigation has distinctly shown that the Australian element is relatively poor; apparently the former conception has been induced by the phytogeographical interest raised by Australian types in an Asiatic flora. It now is obvious that the Papuan flora is mainly Asiatic in character, particularly in the lower regions.

WARBURG (1891, p. 237) mentioned a collection from the lower regions of the former German Division containing 547 non-endemic species. Of these 273 (50 %) were in common with the Malay Archipelago only, 9 with Polynesia only and 6 in Australia only. These 288 species therefore had their area boundary in New Guinea.

Of the 970 species of *Pteridophytes* known to occur in New Guinea in 1920 [1]) the island had in common with

the Malay Archipelago	249	428
„ Philippines	179	
Polynesia	165	
Australia	78	

Of the 25 Sapindaceous genera, known in 1920 [2]), 9 belong to the Asiatic, 12 to the Polynesian and 4 to the Australian group, while of the 26 non-endemic species 24 were Asiatic and 2 cosmopolitic.

It seems that, as far as Western elements are concerned, the relations are particularly strong with the Moluccas (*Excavatia, Haplolobus, Dimorphanthera, Endospermum formicarum, Echinophallus Lauterbachii, Himantandra, Rhitidocaryum, Levieria, Schuurmansia, Aglossorhyncha, Calymmanthera, Tapeinochilus*, etc.), the Philippines (cf. MERRILL 1926), as is, for instance, evidenced by such genera as *Alyxia, Rauwolfia, Osbornia, Macropsychanthus, Papualthia, Parsonsia, Andruris, Anomopanax, Dimorphanthera, Pseudotrophis* and *Epiblastus* and also with Celebes (*Mediocalcar, Steganthera, Pedilochilus*, etc.) and Borneo, particularly Mt. Kinabalu (*Haplolobus, Schuurmansia, Faradaya, Euphrasia, Didiscus, Drimys, Xanthomyrtus*, etc.).

Generally speaking, the Asiatic element decreases in percentage in

1) Engl. Bot. Jahrb. 56, p. 31.
2) Engl. Bot. Jahrb. 56, p. 251.

the mountains. But even there it is prevailing. A small collection of plants made by me above the forest line on Doorman peak (3580 m) consisted of 155 species (among which representatives of 10 endemic genera). Of these 60 % was of Asiatic origin (19 % boreal, 37 % with relations in S.E. Asia and 4 % belonging to endemic genera with Asiatic relations) and 40 % non-Asiatic (16 % Australian, 9 % Antarctic-Polynesian and 15 % belonging to endemic genera with Australian relations). If we compare these figures with those of the mountain flora of Java (TH. SCHMUCKER, l. c.) we must state that at least 88 % of the last-named flora is of Asiatic origin and about 3.5 % non-Asiatic (the rest comprises anthropochores and similar elements).

These few examples, that can easily be amplified, may suffice to show that the Papuan flora is mainly Asiatic and that Polynesian elements are second in rank.

Resuming we may state that:

a. there are no relic-endemisms known at present;

b. there is a strong neo-endemism, especially at higher altitudes;

c. Asiatic floral elements prevail, even in the mountains, Polynesian ones come next and Australian-Antarctic ones apparently last, Australian ones being best represented in the mountains (and in the savannahs);

d. western relations are particularly strong with the Moluccas, the Philippines and Celebes (beside relations with high peaks).

The questions which now arise are:

Do these facts agree with one of the above mentioned theories concerning the geological history of this part of the world, and if so, with which? Can they be explained by one of them, and if so by which?

Let me give a concise review of both.

The theory of the permanency of continents and oceans considers the Malay Archipelago as the remainders of an ancient continental mass that once connected what is now the Continent of Asia (Sunda-shelf) and that of Australia (with New Guinea; Sahul-shelf).

Should New Guinea be a part of such an intercontinental land connection that must have been severed a long time ago, then we must find some trace of it in the flora, viz. in old Asiatic types or relic-endemic units. As long as these are not known we have to deny the possibility that New Guinea has formed a part of a former land connection between Asia and Australia, and we have to see whether the other conception may explain the facts enumerated.

I think that, provisionally, there is no reason why we should not

accept WEGENER's views as applying to this part of the world.

According to this remarkable hypothesis, that is of the utmost importance for biogeography, the Australian shelf has disjoined itself from the Antarctic Continent in the Eocene. Drifting northward or northwestward (with New Guinea in front), the shelf came into contact with the most south-eastern parts of Asia, where two or possibly three island arches were lying off the coast of the continent. SMIT SIBINGA has newly made extensive studies of the geological conditions of these arches (orogens) and, accepting WEGENER's hypothesis, has investigated the epeirophoresis (continental shifting) and orogenesis in these parts since the first contact was established. I avail myself of this opportunity to tender him my best thanks for his kind interest in my work and for the valuable informations concerning the subject he was kind enough to provide me with at my request. It is the opinion of Prof. SMIT SIBINGA that of the three arches mentioned the outer one (Pelew-orogen) was almost entirely destroyed (cf. fig. 3); it is only to be traced now by its northernmost remainders. The second one (the Molucca-orogen) was heavily disturbed and partly broken into sections, but can still be followed; the inner arch, finally (the Sunda orogen), has only partly endured a strong deformance but is still intact for long stretches. SMIT SIBINGA further suggests, that the epeirophoresis has not been a process of constant pressure, but that periods of a powerful shifting, during which mountain ranges were raised — the Central Range has originated in this way, and the smaller ranges north of it equally — alternated with periods of relative rest, during which erosive forces undid, partially or wholly, what orogenesis had created. It goes without saying that biogeographical contact by means of land connections can only be expected to be established a long time after the geological contact commenced. Now there have been, in SMIT SIBINGA's opinion, three main epeiphoreses:

1. one rather powerful push in the Old Tertiary that can be traced in the Molucca orogen;

2. a second, very powerful one in the Upper Miocene (Central Range of New Guinea raised?), which can equally be traced in the Molucca orogen and which possibly raised surface contacts (land connections) and

3. a weak shifting of Plio-plistocene age (Northern Ranges of New Guinea raised?) that affected both the Molucca orogen and the Sunda orogen.

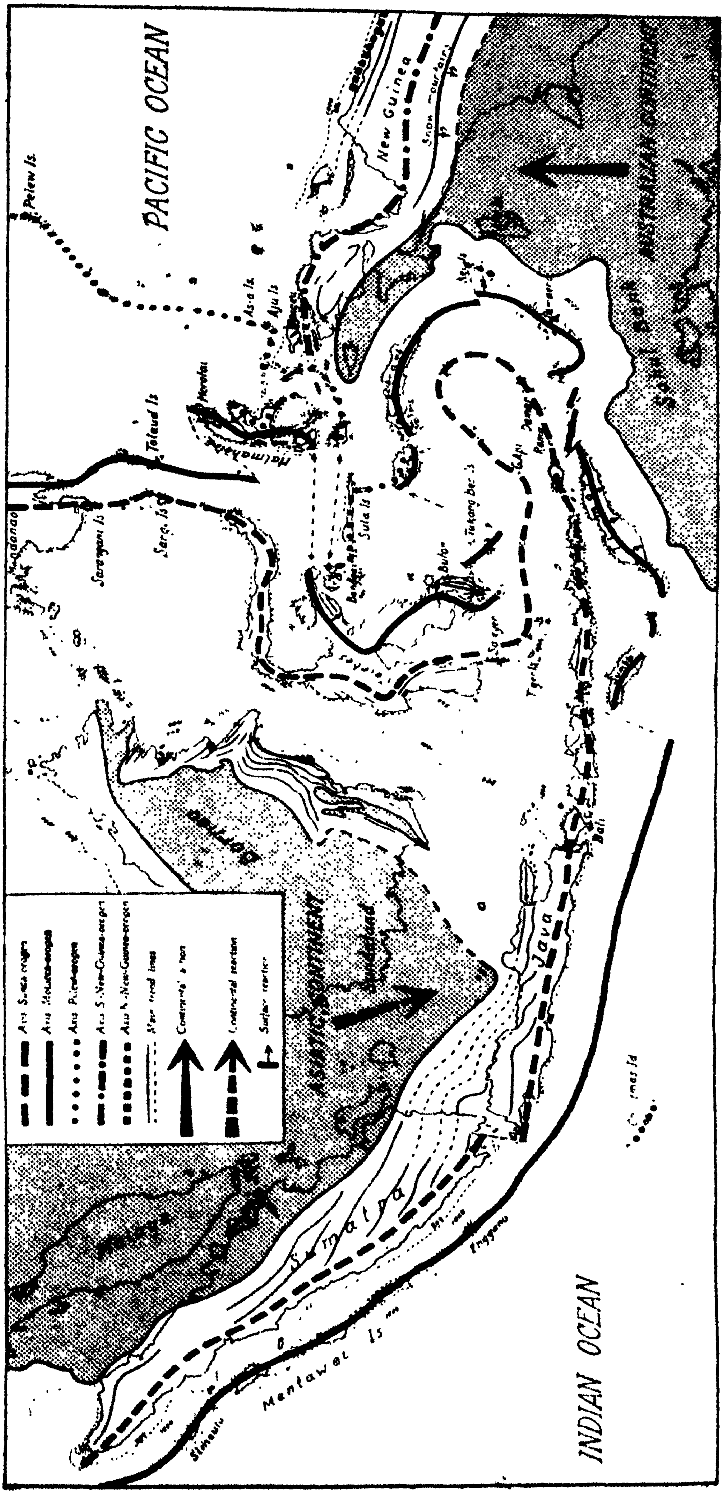

Fig. 3. The Malay orogens, as deformed by the Australian shelf, after SMIT SIBINGA. Courtesy of Dr G. L. SMIT SIBINGA.

Accepting the thesis that the second epeirophoresis was the first with biogeographical consequences and also the most important one, we must state that the biographical contact is relatively young. But we must equally realize that New Guinea, being a part of the Australian continent, must originally have possessed a flora, entirely different from that of Asia and not only different but very much poorer. According to WEGENER's views, the Australian shelf has, ever since the first crustal movements in the Carbon period, been situated quite near the South pole. Only in relatively recent times a part of this shelf has arrived in the tropics [1]) and if this whole conception is true, we cannot but expect that under such conditions, this part has, after the land connections had been established, been overrun with tropical species.

It is equally obvious that the largest part of these species were hailing from the regions that were richest as to their flora and with which the contact was probably most intense, viz. Asia (the Malay Arches); but it is, according to this conception, also understandable that Polynesian elements though hailing from relatively small and scattered islands, are second in rank, and that of the purely Australian elements only a relatively small number has succeeded in adaptation to such different conditions. And it is quite in accordance with the present conception that Australian types have more particularly survived or settled in those areas whose conditions are the least deviating from what may be supposed to be former and what are present Australian conditions, viz. in the cooler mountains and in the drier savannahs.

I cannot help, finally, to apologize for the above, fairly bold and perhaps somewhat premature, conception. It has only been my aim to gather some provisional data; to stipulate one of the most interesting biogeographical problems extant; to show a possibility of solving it; and to indicate the many points that are still unknown. It is my intention to gather, in the years to come, more detailed information, without, I hope, being prejudiced and I will feel very much satisfied, if I have raised the interest of biogeographers, and stimulated them to contribute data or opinions [2]) in order that we may, in collaboration, mutually and with the geologists, finally come to some solution.

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1) The Malay Archipelago has, probably, never seriously been affected by polar movements and has always had a tropical climate.

2) As the Editor of „Blumea'' I will be glad to offer hospitality to such papers that might deal with the above subject. H. J. L.

Annex I.

More important collectors in New Guinea.

1. *Vogelkop* (cf. GIBBS, 1917).

1824 — P. LESSON (Dorei; on board "Coquille").
1871 — J. E. TEYSMANN (Dorei, etc.).
1872 — L. M. D'ALBERTIS (Hatam, 1500 m).
1872, 1875 — O. BECCARI (Hatam, 1500—2000 m).
1889 — O. WARBURG (Manoekwari).
1891 — D. BURKE (Hatam, orchids).
1912 — K. GJELLERUP (Angi-lakes); much material lost).
1912 — R. F. JANOWSKY (Manoekwari).
1913 — L. S. GIBBS (Angi-lakes, etc.).
1928 — E. MAYR (Arfak, Wandammen).

2. *Dutch North New Guinea.*

1903 — A. WICHMANN (nat. ass.: ATASRIP; W. coast Geelvinck bay, Cycloop Range, Hollandia, Sentani-lake).
1910 — M. MOSZKOWSKY (Mamberamo and Van Daalen Riv.; much material lost).
1910—1911 — K. GJELLERUP (Gauttier Mts., Boundary; partly lost).
1912 — R. F. JANOWSKY (N. coast).
1913 — KORNASSI (nat. coll.; N. coast).
1913—1915 — A. C. TH. THOMSEN (Mamberamo).
1914 — W. K. H. FEUILLETAU DE BRUYN (nat. ass. AJOEB; Schouten Is., Mamberamo, Idenburg Riv.).
1914 — L. A. C. M. DOORMAN (Doorman peak).
1919—1920 — H. J. LAM (Mamberamo, Doorman peak, Central Range).
1926 — W. M. DOCTERS VAN LEEUWEN (Mamberamo, Central Range).
1928 — E. MAYR (Cycloop Mts.).
1931 — G. STEIN (Weyland Mts., Japen, Waigeoe).

3. *Dutch South New Guinea.*

1828 — A. ZIPPEL (Etna bay, Triton bay).
1901 — JAHERI (nat. coll.).
1904—1905 — J. W. R. KOCH (Merauke, Etna bay, Digoel Riv.).
1907 — G. M. VERSTEEG (S. of Wilhelmina peak).
1907—1908 — B. BRANDERHORST (Merauke, Fred. Hendr. Isl., Eilanden Riv., Digoel Riv., Otakwa Riv., Noord Riv.).
1908—1912 — J. M. DUMAS (Merauke c.a., Digoel Riv. etc.).

1909 — L. S. A. M. von Römer (S. of Wilhelmina peak).
1909 — J. H. J. le Cocq d'Armandville (Kents Mts.).
1911 — C. Boden Kloss (S. of Carstensz peak).
1911 — A. C. de Cock (Eilanden Riv.).
1912—1913 — A. A. Pulle (S. of Wilhelmina peak).

4. *Territory of New Guinea* (cf. Schumann & Lauterbach, 1905).

1875 — C. Naumann.
1886—1888 — M. Hollrung.
1887—1889 — L. Kärnbach.
1888 — F. C. Hellwig.
1889 — O. Warburg.
1889—1891 — C. A. F. Weinland.
1890—1891, 1896, 1899—1900 — C. Lauterbach.
1899 — E. O. A. Nyman.
1901—1902, 1907—1909 — R. Schlechter.
1910 — Peekel (N. Brit.).
1910 — Schultze.
1912—1914 — C. Ledermann.
1912, 1916 — Chr. Keysser.
1922—1923 — C. E. Lane-Poole.
1929 — E. Mayr (Saruwaged= Salawaket).
1933 — L. J. Brass.

5. *Territory of Papua* (cf. White, 1922).

1875 — Sir Wm. Macleay (Isl. Torres Str., Mainland)
1875 — Rev. S. MacFarlane (Baxter and Fly River).
1875 — L. M. d'Albertis (Yule Isl. and Mekeo).
1875—1877 — L. M. d'Albertis (Fly River).
1876—1877 — A. Goldie.
1884—1887 — Rev. Jas. Chalmers.
1885 — H. O. Forbes (Sogeri).
1886 — W. Bauerlen.
1888—1898 — Sir William MacGregor (Fly Riv., Astrolabe Range, Mt. Victoria).
1889 — Sir William MacGregor (Owen Stanley Range).
1897 — Sir William MacGregor (Mt. Scratchley).
± 1896 — Giulianetti and A. C. English (Mt. Scratchley, Wharton Range, Vanaipa Valley).
1898 — F. M. Bailey.

1899—1903 — Sir G. R. LE HUNTE.
1904—1907 — F. R. BARTON.
± 1907—1910 — Rev. C. KING (Ambasi).
1908 — Mrs. H. T. SCHLENCKER (Boku).
1918 — C. T. WHITE (Dilava-Mafula, Yule Isl. distr.).
1922—1923 — C. E. LANE-POOLE.
± 1925 — Rev. L. TURNER (Rigo distr.).
1925—1926, 1933 — L. J. BRASS.
1929 — E. MAYR.

Annex II.

More important literature on the Botany of New Guinea. 1)

General information:

Annales du Jardin Botanique de Buitenzorg.
Bibliotheca Botanica.
Bulletin du Jardin Botanique de Buitenzorg.
Bulletin Dépt. Agric. Ind. Néerland.
Journal of Botany.
*Mededeelingen van het Encyclopaedisch Bureau: XXI. Schouten en Paidaido Eilanden. (W. K. H. Feuilletau de Bruyn) 1920.
*Mededeelingen Afd. Bestuurszaken van de Buitengewesten, Serie A No. 2. Het Gouvernement der Molukken. (A. J. BEVERSLUIS en A. H. G. GIEBEN) 1929.
Verslag Militaire Expl. Ned. Nieuw-Guinea 1907—1915. — Welt. 1920.
Z. W. Nieuw-Guinea expeditie van 1904—1905. — E. J. Brill, Leiden 1908.
Verslag der commissie (Uittreksel uit het —) ter voorbereiding van de aanwijzing eener natuurlijke grens tusschen het Nederlandsche en het Duitsche gebied op Nieuw-Guinea (1910—1911).

C. Lauterbach e. o., **Beiträge zur Flora von Papuasien.** — Engl. Bot. Jahrb., 1912 - hodie.

	Vol.	Year	Page	Beitr. Part	Nr.
Acanthaceae	50	1913	164	II	18
„	55	1918	135	VI	54
Alangiaceae	60	1926	162	XIII	109
Amaryllidaceae	50	1913	301	III	21
Anacardiaceae	56	1920	345	VII	66
„	59	1925	535	XII	99
Anonaceae	49	1912	113	I	8
„	52	1915	177	IV	35
Apocynaceae	61	1927	164	XIV	117

1) An asterisk denotes that special mention has been made of the literature concerning the subject.

	Vol.	Year	Page	Beitr. Part.	Nr.
Aquifoliaceae	59	1925	80	XI	93
Araceae	49	1912	90	I	5
„	54	1917	74	V	39
Araliaceae	56	1920	374	VII	67
Aristolochiaceae	52	1915	104	IV	29
„	58	1923	488	X	89
Asclepiadaceae	50	1913	81	II	17
Balanophoraceae	50	1913	68	II	14
Balsaminaceae	55	1918	114	VI	51
Begoniaceae	50	1913	335	III	25
Bignoniaceae	57	1922	496	VIII	78
Burmanniaceae	49	1912	100	I	6
„	55	1918	202	VI	57
Burseraceae	56	1920	317	VII	64
Caesalpiniaceae	55	1918	19	VI	49
Campanulaceae	55	1918	121	VI	52
Capparidaceae	52	1915	108	IV	30
„	61	1927	30	XIV	115
Caryophyllaceae	61	1927	164	XIV	117
Cinnamomum	58	1923	492	X	90
Combretaceae	57	1922	427	VIII	73
Commelinaceae	50	1913	54	II	12
Connaraceae	58	1923	178	IX	83
Compositae	62	1929	386	XVI	124
Convolvulaceae	59	1925	84	XI	94
Cornaceae	60	1926	167	XIII	110
Corsiaceae	49	1912	109	I	7
Cruciferae	55	1918	265	VI	60
Cucurbitaceae	60	1926	150	XIII	108
Cunoniaceae	52	1915	138	IV	33
Cyperaceae	59	1925	41	XI	91
Dichapetalaceae	49	1912	168	I	9
„	62	1929	341	XVI	119
Dilleniaceae	57	1922	436	VIII	75
Dipterocarpaceae	57	1922	460	VIII	76
Elaeocarpaceae	54	1917	92	V	40
Ericaceae	55	1918	137	VI	55
Erythroxylaceae	58	1923	249	X	83
Flacourtiaceae	55	1918	273	VI	61
Flagellariaceae	50	1913	288	III	19
„	59	1925	544	XII	103
Fungi	54	1917	246	V	47
„	57	1922	321	VIII	68
Gentianaceae	61	1927	28	XIV	114
Gesneraceae	58	1923	255	X	85

	Vol.	Year	Page	Beitr. Part.	Nr.
Gnetaceae	60	1926	144	XIII	107
Gramineae	52	1915	167	IV	34
Guttiferae	58	1923	1	IX	80
„	61	1927	30	XIV	115
Halorrhagaceae	61	1927	26	XIV	113
Himantandra	55	1918	126	VI	53
Hydrocharitaceae	49	1912	68	I	3
Icacinaceae	58	1923	155	IX	82
Juglandaceae	50	1913	66	II	13
Labiatae	62	1929	376	XVI	122
Lauraceae (cf. also sub Cinnamomum)	58	1923	380	X	86
Lichenes	58	1923	250	X	84
Lecythidaceae	57	1922	341	VIII	70
Lentibulariaceae	62	1929	382	XVI	123
Liliaceae	59	1925	547	XII	104
„	50	1913	290	III	20
Linaceae	52	1915	115	IV	31
Loganiaceae	54	1917	156	V	41
Loranthaceae	57	1922	464	VIII	77
Lycopodiaceae	54	1917	226	V	45
Lythraceae	61	1927	23	XIV	112
Magnoliaceae	50	1913	70	II	15
„	54	1917	239	V	46
Melastomaceae	60	1926	105	XIII	106
Menispermaceae	52	1915	187	IV	36
Mimosaceae	55	1918	19	VI	49
Monimiaceae	52	1915	191	IV	37
„	55	1918	195	VI	56
„	58	1923	244	X	82
Musaceae	50	1913	306	III	22
Musci	55	1918	19	VI	48
Myricaceae	59	1925	540	XII	101
Myrtaceae	57	1922	356	VIII	72
Nyctaginaceae	52	1915	101	IV	28
Oleaceae	61	1927	1	XIV	111
Olacaceae	58	1923	155	IX	82
Opiliaceae	58	1923	155	IX	82
Orchidaceae	58	1923	50	IX	81
„	66	1934	161	XX	126
Palmae	52	1915	19	IV	26
„	28	1923	441	X	87
Pandanaceae	49	1912	60	I	2
Pinaceae	50	1913	46	II	11
Piperaceae	55	1918	204	VI	58

Nova Guinea.

Résultats des Expéditions scientifiques à la Nouvelle Guinée,

Vol. VIII (1909—1914), XII (1913—1917), XIV (1924—1932).

	Vol.	Part	Year	Page
Hydrocharitaceae	VIII	5	1913	915
Icacinaceae	„	4	1912	657
„	XIV	2	1927	275
Iridaceae	„	1	1924	114
Lauraceae	VIII	4	1912	819
Lecythidaceae	„	2	1910	315
„	„	4	1912	845
Leguminosae I Mimos.	„	2	1910	369
Leguminosae II Caesalp.	„	„	„	373
Leguminosae III Papil.	„	„	„	375
Leguminosae	„	4	1912	649
Liliaceae	„	„	„	663
„	„	6	1914	989
„	XIV	2	1927	173
Linaceae	VIII	„	1910	391
„	XIV	1	1924	112
Loganiaceae	VIII	1	1909	201
„	XIV	1	1924	115
Loranthaceae	VIII	2	1910	289
„	„	4	1912	815
„	XIV	1	1924	100
Lythraceae	VIII	4	1912	675
Magnoliaceae	„	„	„	633
„	XIV	1	1924	75
Malvaceae	„	„	„	159
Melastomaceae	„	2	1927	199
Meliaceae	VIII	„	1910	423
Menispermaceae	„	„	„	283
„	„	4	1912	869
„	XIV	1	1924	80
Monimiaceae	VIII	4	1912	876
Musci	„	„	„	735
„	XII	2	1914	109
Myristicaceae	VIII	4	1912	635
Myrtaceae	„	2	1910	319
„	„	4	1912	849
„	XIV	1	1924	85
Nepenthaceae	VIII	2	1910	339
Nyctaginaceae	„	„	„	353
„	„	4	1912	629
Nymphaeaceae	„	2	1910	361
Ochnaceae	„	4	1912	667
Oenotheraceae	„	2	1910	395
„	„	4	1912	681
Oleaceae	„	2	1910	409

	Vol.	Part	Year	Page
Sapindaceae	VIII	1	1909	171
"	"	4	1912	617
"	XIV	2	1927	181
Sapotaceae	VIII	3	1911	435
"	XIV	4	1932	549
Saxifragaceae	VIII	"	1912	821
"	XII	5	1917	487
"	XIV	1	1924	148
Scrophulariaceae	"	4	1932	534
Sonneratiaceae	VIII	"	1912	677
Stackhousiaceae	XIV	2	1927	307
Stemonaceae	VIII	1	1909	198
"	XIV	2	1927	208
Sterculiaceae	VIII	4	1912	665
Stylidiaceae	XIV	2	1927	195
Symplocaceae	VIII	4	1912	857
"	XIV	2	1927	186
Taxaceae	VIII	1	1909	177
"	"	4	1912	615
Theaceae	"	"	"	841
Thymelaeaceae	"	2	1910	411
Triuridaceae	"	1	1909	165
"	XIV	2	1927	323
Typhaceae	VIII	5	1913	911
Ulmaceae	"	4	1912	891
Urticaceae	XIV	1	1924	119
Verbenaceae	VIII	2	1910	401
"	"	4	1912	685
"	XIV	1	1924	167
Violaceae	VIII	4	1912	669
Vitaceae	"	2	1910	301
"	"	4	1912	831
"	XIV	1	1924	136
Xyridaceae	VIII	5	1913	903
Zingiberaceae	"	"	"	923

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SUBSTANZBEGRIFF UND SYSTEMATIK

von

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Zusammenfassung: Bei der Einteilung der Organismen, welche in dieser Arbeit nur von botanischem Gesichtspunkt betrachtet wird, ist die Frage nach „wesentlichen'' Merkmalen oder Einteilungsgründen von grosser Wichtigkeit. Es ist die Frage nach der Substanz (Essenz) und den akzidentellen Merkmalen. Der Substanzbegriff entstammt der Aristotelischen Logik und Metaphysik. Aeltere Botaniker, die sich die prinzipiellen Grundlagen ihres Systems klarzustellen versuchen, sind z.B. CESALPIN und RAY. CESALPIN kommt in seiner Auffassung der Substanz ARISTOTELES sehr nah. RAY, obwohl öfters noch Aristotelisch beeinflusst, hat eine typisch empiristische Auffassung der Substanz, wodurch er sich den Ansichten LOCKEs anschliesst. Auch in den modernen Theorien treten substantielle Formen auf. DRIESCH stellt seine Entelechie gleich Substanz, aber diese ist in der Systematik jetzt noch nicht anwendbar. VAVILOV hat in seinem Begriff „Radikal'' eine substantielle Form, die der Aristotelischen sehr nahe steht, indem sie durch Abstraktion dargestellt worden ist. Diese Form ist sehr brauchbar, sagt aber nur wenig aus. Von genetischer und physiologischer Seite versucht man Funktionsbegriffe einzuführen, welche jetzt aber in der Biologie nur eine sehr beschränkte Anwendung finden können. Ungeachtet ihrer Bedeutung, mit für die Systematik, kann man in letzterer Wissenschaft die festen, beharrlichen substantiellen Formen nicht entbehren, weil ohne diese jetzt noch keine Systematik möglich ist.

Inhalt.

I. Einleitung.

Nichts liegt diesem Versuch weniger fern als Vollständigkeit. Eine historisch-kritische und systematisch-logische Untersuchung über die Bedeutung der Substanzkategorie für die botanische Klassifikation würde sich weit über das diesem Aufsatz gestellte Ziel hinaus erstrecken. In einer solchen Monographie sollten die Prinzipien der Systematik ein-

gehend berücksichtigt werden, und der Verfasser würde nicht umhinkönnen zu versuchen eine Lösung für das Problem zu geben.

Doch vorliegende Arbeit will keine Ansprüche erheben. Sie gibt bloss einige durch die Betrachtung älterer und moderner Theorien angeregten Gedanken des Verfassers. Er glaubt, dass sich im Ringen um eine wissenschaftliche und natürliche Systematik mehrere Theorien vielleicht unter dem Begriff der Substanz und seiner Verwandlungen von einem gemeinsamen Gesichtspunkte aus fassen liessen. Dieser Gesichtspunkt wird sich an einigen historischen und modernen Theorien veranschaulichen. Indessen wird der Verfasser sich soviel wie möglich auf streng historischen Standpunkt stellen und auch die modernen Theorien gewissermassen als geschichtliche Tatsachen (d.h. ohne Stellungnahme ihnen gegenüber) betrachten. Vielleicht lässt sich später eine theoretische Begründung des angeführten Gesichtspunktes geben.

II. Substanzbegriff.

Bevor wir weiter gehen, sollen wir uns abfragen was unter „Substanz'' zu verstehen ist. Sogar für eine sehr knappe Darstellung, wie wir sie zu geben versuchen, kann man am besten auf ARISTOTELES selbst zurückgehen. Erstens weil der Substanzbegriff wesentlich seinen Ursprung in der peripatetischen Philosophie hat, zweitens weil diese Fassung des Substanzbegriffes für die Biologie die prägnanteste Bedeutung hat.

Substanz (*substantia*) dann ist ein Terminus, der sich in dieser besonderen Bedeutung bei den mittelalterlichen lateinischen Uebersetzern des ARISTOTELES findet, und wohl statt des griechischen *οὐσία*, welches Wesenheit (*essentia*) bedeutet [1]). Es ist ohne weiteres nicht ganz klar was ARISTOTELES selbst unter *οὐσία* verstanden hat. Wir schliessen uns in der Darstellung mehr oder weniger der P. H. RITTERS (29) an, und geben um die sachliche Auseinandersetzung zu verdeutlichen, als Beispiele einige Zitate des ARISTOTELES selbst[2]).

Die beiden ersten Teile der Aristotelischen Logik handeln von den Kategorien und vom Satze. Der Satz (Urteil) ist einer der Hauptgegen-

1) Ob diese Uebersetzung berechtigt ist, lassen wir dahingestellt sein: Es handelt sich hier nicht um eine kritische Untersuchung des Substanzbegriffes im Mittelalter: nur um die Bedeutung welche dieser Begriff später erhalten hat.

2) Wir entnehmen die gesammten ARISTOTELES-Zitaten der Deutschen Uebersetzungen ROLFES und BUSSES in der *Philosophischen Bibliothek* (1, 2, 3, 4). Die Zusätze des Verfassers sind durch eckige Klammern angedeutet.

stände der Logik. Im Satze wird vom Subjekt etwas ausgesagt (Prädikat). Die „Hauptgattungen der Aussagen über das Seiende" sind die Kategorien. ARISTOTELES hat acht, bezw. zehn Kategorien aufgezählt, als erste die Substanz (*οὐσία*), daneben die akzidentellen Kategorien, Qualität, Quantität, Relation, usw. Die im Prädikat begriffene Substanzkategorie kann aber nicht das Einzelding (Individuum) sein, denn vom Subjekt (== Einzelding) kann man (ohne Tautologie) nicht ein Einzelding aussagen. Die logische Substanzkategorie muss also der Art- oder Gattungsbegriff sein (*Nomen*). Das Subjekt als konkretes Einzelding (Individuum) wird von ARISTOTELES ebenfalls als *οὐσία* (Seiendes) bezeichnet (Vgl. unten die Erörterung über das metaphysische Substanzbegriff). Die erste Zweideutigkeit ergibt sich hier sogleich, indem sowohl das Einzelding als reales Substrat und Subjekt des Satzes, als der Gattungsbegriff *οὐσία* genannt werden. Zur Unterscheidung werden die Gattungsbegriffe daher als „zweite Substanzen" (*δεύτεραι οὐσίαι*) angedeutet. Dass ARISTOTELES die „zweiten Substanzen" doch als Substanz bezeichnen kann, ist seiner Auffassung, dass „Art" Subjekt der „Gattung" usw. sein kann, zu verdanken.

> Substanz im eigentlichsten, ursprunglichsten und vorzüglichsten Sinne ist die, die weder von einem Subjekt ausgesagt wird, noch in einem Subjekt ist, wie z.B. ein bestimmter Mensch oder ein bestimmtes Pferd.
>
> Zweite Substanzen heissen die Arten, zu denen die Substanzen im ersten Sinne gehören, sie und ihre Gattungen. So gehört z.B. ein bestimmter Mensch zu der Art Mensch, und die Gattung der Art ist das Sinnenwesen [*ζῶον*]. Sie also heissen Substanzen, Mensch z.B. und Sinnenwesen.
>
> ...... — Ueberdies heissen die ersten Substanzen deshalb in vorzüglichem Sinne Substanzen, weil sie Subjekt von allem anderen sind und alles andere von ihnen ausgesagt wird. Wie sich aber nun die ersten Substanzen zu allem andern verhalten, so verhält sich auch die Art zu der Gattung. Denn die Art ist Subjekt der Gattung: die Gattungen werden von den Arten ausgesagt, aber die Arten nicht umgekehrt von den Gattungen. So folgt denn auch hieraus, dass die Art mehr Substanz ist als die Gattung (ARIST., *Kateg.* V) (1).

Nach ARISTOTELES hat nur die Substanz ein selbständiges Sein. Die anderen Kategorien haben ein Sein, das aber nicht von dem der Substanz trennbar ist. Die Substanz ist also ebenfalls Substrat, das die Eigenschaften trägt. In dieser Beziehung ist *substantia* (von *sub* und *stare*) die wörtliche Uebersetzung des Griechischen *ὑποκείμενον* (eig. das darunter Liegende) [1]. Die Substanzen können, im Gegensatz zu den

1) Wie ROLFES (4, p. 205) bemerkt, hat das Wort *ὑποκείμενον* bei ARISTOTELES zweierlei Bedeutung: erstens bedeutet es Materie, zweitens das „Dieses", die Substanz, als Trägerin der Akzidenzien.

Akzidenzien, entgegengesetzte Eigenschaften annehmen, bleiben aber doch immer sich selbst (Identität). Die Akzidenzien aber kommen und gehen, und ändern sich nicht.

> Am meisten aber scheint es der Substanz eigentümlich zu sein, dass sie, wie wohl der Zahl nach ein und dasselbe, für konträres empfänglich ist...... So wird z.B. ein bestimmter Mensch, obwohl er einer und derselbe ist, bald weiss, bald schwarz, warm und kalt, schlecht und gut (*Kat.* V) (1).

Dieser Eigenschaftsträger mag ARISTOTELES selbst wahrscheinlich nicht als eigenschaftslos gedacht haben.

Hier ergibt sich sogleich einen Uebergang vom logischen zum ontologischen Substanzbegriff. Eine schärfere Trennung der beiden lässt sich nur an sehr wenigen Stellen finden. Nicht z.B. an folgender:

> Das Seiende wird vielfach ausgesagt,...... Denn ein Seiendes bezeichnet das W a s eines Dinges und bezeichnet etwas als ein D i e s e s, ein anderes die Qualität oder sonst eine von den Kategorien. Da aber das Seiende so vielfach ausgesagt wird, so ist doch offenbar seine erste Bedeutung das W a s, welches die Substanz bezeichnet. Denn wenn wir sagen, welche Qualität das und das hat, so nennen wir es gut oder schlecht, nicht aber drei Ellen lang oder Mensch, [die beiden letzten sind also nicht Qualität, sondern Quantität, bezw. Substanz]; sagen wir aber, w a s es ist, so nennen wir es nicht weiss oder warm oder drei Ellen lang, sondern Mensch oder Gott. Das andere aber wird Seiendes genannt, weil es an dem so Seienden etwas ist, Quantität, Qualität...... [usw.].
>
> Und auch die von altersher wie gegenwärtig und allezeit aufgeworfene und nie genügend aufgehellte Frage: w a s i s t d a s S e i e n d e, bedeutet nicht anders als: w a s i s t d i e S u b s t a n z? (*Met.* VII, 1) (4).

Dieses Zitat zeigt den Gegensatz zwischen dem an sich Seienden (Substanz) und dem nur an der Substanz Seienden. An dieser Stelle ist indessen vielmehr Metaphysik als Logik! Wir führen sie aber doch hier an, wegen des scharf formulierten Gegensatzes.

Mit der Erfassung dieses logischen Substanzbegriffes hat ARISTOTELES, wie SPRUYT (32) zurecht bemerkt, eigentlich nichts anderes als eine grammatische Bestimmung des gewöhnlichen Sprachgebrauchs gemacht. Vgl. auch VORLAENDER: „Seine Logik ist im Grunde genommen nur eine, in ihrer Art allerdings grossartige, Zergliederung und Systematisierung der Formen des Satzes'' (35, I, p. 132).

Daneben steht, in weitaus wichtigerer Bedeutung, die Substanz als metaphysischer Begriff. Das wahre Wesen der Dinge (Essenz), für PLATON die Idee, ist für ARISTOTELES etwas ganz anderes. Es ist das b e s t i m m t e E i n z e l d i n g: dieser bestimmte Mensch, jenes be-

stimmte Pferd. Dieses ist also Substanz. Der fundamentale Gegensatz zu PLATON ergibt sich vielleicht deutlicher noch aus Folgendem: Für PLATON besteht das Allgemeine (die Idee) selbständig neben dem Vielen, aber nach ARISTOTELES „breitet es sich über das Viele aus''. „Damit verliert das Allgemeine die Selbständigkeit, die es bei PLATON als Idee hat. Es hört auf Subjekt zu sein, es wird immanent, Attribut. An seine Stelle tritt das Besondere, das Exemplar, das Einzelne als Subjekt. Und dieses ist Wesenheit, *οὐσία*, Substanz'' (RITTER (30), p. 82). In diesem E i n z e l n e n sind Stoff und Form zusammengetreten. Stoff ist nicht Substanz, wie *Met.* VII, 3 gezeigt wird. Am Ende dieses Kapitels heisst es:

> Da nun eingestandenermassen gewisse Substanzen der sinnlichen Dinge bestehen, müssen wir unter diesen zuerst unseren Begriff aufsuchen.

Wie nun RITTER ausführt hat der Substanzbegriff sich seit ARISTOTELES in drei Richtungen entwickelt, welche alle drei ihren Ausgangspunkt bei ARISTOTELES selbst haben. Substanz nämlich hat bei ARISTOTELES dreierlei Bedeutung, oder (vielleicht besser) dreierlei Ansicht:

Erstens ist die Substanz das Wirkliche, Aktuelle, als Form (s. o.).

> Man fragt also nach der Ursache der Materie [z. B. „was ist ein Mensch'', was mit: „warum ist etwas ein Mensch'' (THOMAS V. AQUIN) gleichbedeutend ist], und das ist die Form, durch welche sie ein Was ist, und diese Form ist die Substanz (*Met.* VII, 17) (4).

Form ist hier eine „einfache Substanz''. — Neben dieser einfachen, gibt es auch noch zusammengesetzte Substanzen:

> Was aber so aus etwas anderem zusammengesetzt ist, dass das Ganze eins ist, aber nicht so wie ein Haufe sondern wie eine Silbe, hat als Ganzes ein eigenes Sein. Denn die Silbe ist nicht die Buchstaben und ba nicht dasselbe wie b und a, auch ist das Fleisch nicht Feuer und Erde. Denn nach der Auflösung ist das eine, Fleisch und Silbe, nicht mehr vorhanden, wohl aber die Buchstaben und Feuer und Erde. Die Silbe ist also etwas; nicht bloss die Buchstaben, der Selbstlaut und Mitlaut, sondern noch etwas anderes; und das Fleisch ist nicht bloss Feuer und Erde, oder Warmes und Kaltes, sondern noch etwas anderes.
>
> Jenes andere scheint daher etwas vom Element verschiedenes und die Ursache davon zu sein, dass dieses Fleisch und jenes Silbe ist. Und so ist es auch mit dem übrigen. Das aber nun ist die Substanz eines jeden; denn es ist die erste Ursache [1]) des Seins. Manche von den Dingen sind nun

1) Ursache wird hier in Aristotelischem Sinn aufgefasst als *causa formalis.*

freilich keine Substanzen; bei allem aber, was gemäss der Natur oder durch die Natur als Substanz besteht, muss diese Natur als Substanz erscheinen, die nicht Element, sondern Prinzip ist. Element aber ist, worin etwas als in seine materiellen Bestandteile zerlegt wird. Element der Silbe z.B. a und b (*Met.* VII, 17) (4).

Hier ist nun die zweite Form des Substanzbegriffes gegeben: das Prinzip, dass im Gegensatz zu den Elementen immer in derselben Form anwesend ist, das Beharrende im Fluss der Erscheinungen; also das, was sich selbst bleibt, indem die Akzidenzien wechseln. Hier also sind wir dem logischen Substanzbegriff am nächsten.

Die dritte Bedeutung der Substanz ist das Einzelne, Individuelle (s. o.), das aus Materie und Form, Potentialität und Aktualität, zusammengesetzte, z.B. die eherne Kugel, die aus Bronze (Materie) und Form (Kugel) zusammengesetzt ist.

Man muss hierbei immer bedenken, dass, obwohl ARISTOTELES wesentlich eine ontologische Fragestellung hat, Logik und Metaphysik bei ihm noch immer, wenn auch weniger als bei PLATON, eng mit einander verknüpft und von einander durchdrungen sind. Das erleichtert unsere Frage nicht. Hiermit ergibt sich ein Gegensatz zu PLATON, dessen Fragestellung wesentlich eine erkenntnistheoretische ist. Bei ARISTOTELES überwiegt ein realistischer, naiver Standpunkt, mit einer starken Betonung der klassifizierenden Logik. In dieser Beziehung gilt die Definition als Wesensbestimmung. Zu einer entsprechenden Definition braucht man die Gattungs- und Artbegriffe, also wird das Wesen von der Klassenzugehörigkeit angedeutet. In diesem Punkte nun nähern wir uns den Prinzipien der biologischen Systematik, welche wir gleich betrachten wollen.

Es möge hier noch hervorgehoben sein, dass die Unklarheit des Aristotelischen Substanzbegriffes wesentlich auf die Verwischung von ersten und zweiten Substanzen zurückzuführen ist. Erst später hat sich eine begriffliche Trennung vollzogen, indem man die erste Substanz unterschied als Substrat, Träger der Akzidenzien, und die zweite Substanz (Gattungsbegriff) als Essenz. Es ist speziell diese letztere, die uns in den späteren Diskussionen interessiert.

III. Systematik.

Unter Systematik im weitesten Sinne wollen wir die Ordnung der zu einer Wissenschaft gehörenden Begriffe, Theorien und Axiome verstehen. In jeder Wissenschaft gibt es also einen systematischen Teil.

In der Philosophie, Theologie u.a.w., ist diese Bezeichnung sehr üblich. Das System steht hier didaktisch am Anfang, theoretisch am Ende der Wissenschaft. Auch in der Biologie hat man ein solches System, oder wenigstens Versuche zu einem solchen System zu geraten (z.B. BURCKHARDT, TSCHULOK, A. MEYER). In der Biologie hat aber der Terminus „System" die prägnante Bedeutung der Ordnung der Organismen. Freilich ist die Bezeichnung in dieser Form nicht ganz korrekt, denn Organismen ordnet man z.B. in zoologischen Gärten, oder (konserviert) in Herbarien. Man möchte sagen: Systematik ist Ordnung der auf Grund des Studiums der Organismen gebildeten *Gattungsbegriffe[1]). In diesem Aufsatz nehmen wir den Terminus Systematik immer in dieser prägnanten Bedeutung. Hier ist Systematik gleich Einteilungswissenschaft, Taxonomie. Letzterer Terminus wird aber in der deutschen Sprache nur wenig angewandt.

Die biologische Systematik als Einteilungswissenschaft ist ein „rein logisches Geschäft" (DRIESCH) (10). Wenn die *Spezies festgestellt sind, d.h. wenn man in bestimmter Weise eine Gruppe von Individuen als *Spezies bezeichnet hat, handelt es sich darum diese zu definieren, d.h. sie in das entsprechende **genus proximum* als nächst höheren, superordinierten Begriff einzuordnen. Von diesem **genus proximum* sollen dann auch alle höheren *Gattungen ausgesagt werden. Sagt man z.B. *Rosa canina,* dann wird von dieser Speziesbezeichnung ausgesagt, dasz die Spezies zu der Gattung *Rosa,* diese zu der Tribus *Rosoideae* (**genus proximum* in Bezug auf die „Gattung" im botanischen Sinn) und diese zu der Familie der *Rosaceae* gehört, usw. bis zu der letzt höchsten Gruppe (*Phylum*), etwa *Cormophyta.* — Um zu einem vollständigen System zu geraten soll man neben der Superordination auch die Koordination und die Subordination der *Gattungsbegriffe kennen. Für die Subordination gilt im grossen ganzen dasselbe wie für die Superordination.

Bei der Koordination nun werden Gruppen an einander angereiht, und unter einen gemeinsamen superordinierten Begriff gestellt, die logisch ganz gleichwertig sind. Für die höchsten *Gattungen

*) Mit einem * bezeichnen wir in diesem Abschnitt diejenige Termini, die in der Logik und Systematik beide vorkommen, wenn wir sie im Sinne der Logik verstehen wollen.

1) „Unter „Systematik" wird immer noch nur die Ordnung der aus Individuen gebildeten höheren Gruppen verstanden" (BURCKHARDT, (5), p. 391).

(*Phyla*) aber ist es weniger klar, dass sie gleichwertig sind. Beachtet man die Reihenfolge *Schizophyta—Cormophyta*, so leuchtet es ein, dass die Phyla zwar logisch wohl, inhaltlich aber nicht gleichwertig sind. Denn es ist hier eine Stufenfolge möglich, die zwar keine Superordination ist, aber doch vom Einfachen bis zum Komplizierten fortschreitet. Wie SCHAFFNER (30) es ausdruckt: Jedes folgende Unterreich (das indessen keine phylogenetische Bedeutung hat) ist um etwas reicher als das vorangehende. Es ist das für die Stämme vielleicht etwas zu simplistisch ausgesagt, und in besonderer Beziehung zu SCHAFFNERS Unterreiche, die sich nicht mit WETTSTEINS Stämmen decken, aufzufassen, aber die inhaltliche Ungleichwertigkeit als Prinzip bleibt [1]). Man könnte hier vielleicht von einer Kontingenz der Phyla reden [2]). Immerhin sind die Phyla die Gruppen, die am leichtesten zu unterscheiden sind, weil sie untereinander ein Minimum übereinstimmender Merkmale haben.

Wir wollen hier nochmals hervorheben, dass wir den Terminus Systematik in dem üblichen, d.h. logisch nicht reinen, aber historisch gewordenen Sinn anwenden, und dass wir die an sich berechtigte Auseinanderlegung dieser Systematik in Diagnostik, Typologie und Phylogenie (A. MEYER) (18) ausser Betracht lassen. Nur die Phylogenie wird an einigen Stellen gesondert betrachtet werden. Immerhin ist in einer der in der Literatur am meisten angeführten Definitionen der Systematik, in der von R. WETTSTEIN (38) aufgestellten [3]), die Ver-

1) DRIESCH (10, S. 255) spricht von einem „Prinzip der Abstufung von Aehnlichkeiten und Verschiedenheiten" als Grundlage des Systems der Pflanzen und Tiere.

2) Es ist in dieser Beziehung merkwürdig, dass LOTSY (17) auf das ausserordentlich hohe Alter der Phyla hingewiesen hat. Ist das Phylum einmal entstanden, dann wird der Bauplan allen folgenden Deszendenten in gleicher Weise weitergegeben.

3) „Aufgabe der systematischen Botanik ist die Feststellung der Pflanzen, welche jetzt existieren, sowie derjenigen, welche in frühern Perioden der Erdentwickelung lebten, und der Versuch, sie zu einem System zu gruppieren; dieses System soll einerseits der wissenschaftlichen Forderung gerecht werden, eine Darstellung der entwicklungsgeschichtlichen Beziehungen der Pflanzen zu einander zu geben, andererseits dem praktischen Bedürfnisse nach Uebersicht entsprechen". Man vergleiche auch CESALPINS Bemerkung: *qui autem secundum naturarum societatem assignatur, omnium facilius reperitur, tutissimus, utilissimusque ad memoriam, ...*

knüpfung von Diagnostik und Phylogenie besonders hervorgehoben.

Die Auflehnung gegen eine derartige Kontamination hat sich in den letzten Jahrzehnten besonders geltend gemacht. Einerseits war dazu die oben angeführte logische Vertiefung der Wissenschaftseinteilung von Bedeutung, andererseits die Schwierigkeit den Verlauf der Phylogenie einwandfrei festzustellen, überdies die Behauptung, dass es nicht möglich sei zu einer wissenschaftlichen Darstellung der Phylogenie zu geraten [1]). Die Kontamination hat weniger logische, als vielmehr psychologische Ursachen. Wenn auch Diagnostik, Typologie und Phylogenie logisch kontingente Wissensgebiete sind (A. MEYER), so gibt es wohl kaum einen Diagnostiker, der in dem reinen Beschreiben und Unterscheiden genüge fände. Wenn er nicht all zu beschränkt ist, greift er über sein Speziellgebiet hinaus und wendet sich mehr theoretischen Wissenschaften zu. Und eben der gewandte Diagnostiker hat schon eine grosse Tatsachenmenge und Einsicht in Uebereinstimmungen und Verschiedenheiten zu seiner Disposition, durch die er in der Typologie oder Phylogenie bald erfolgreich arbeiten kann. Allerdings darf man dabei nicht übersehen, dass der „Blick" des Diagnostikers in anderer Weise „schaut" als der des Typologen oder Phylogenetikers. Aber für alle drei ist eine gewisse „eidetische" Veranlagung von grosser Wichtigkeit.

Die für unsere Betrachtung wichtige Frage ist die nach den Einteilungsgründen der heutigen Systematik. Diese werden bekannterweise zum überaus grössten Teil den morphologischen Eigentümlichkeiten der Pflanzen entnommen. Für die *Phyla* sind dabei Generationswechsel, Fortpflanzung, usw. von Wichtigkeit. Für die Unterscheidung niederer Gattungen dienen Zahl und Beschaffenheit der Organe.

Es fragt sich nun sofort ob alle Merkmale oder Merkmalgruppen für eine Einteilung von gleicher Wichtigkeit sind. Eine einfache Betrachtung der Geschichte der Systematik führt zu der Ansicht, dass dies nicht der Fall ist. Eine weitere logische Ueberlegung ergibt, dass es „wesentliche" und mehr oder weniger „unwesentliche" Merkmale gibt. ZIEHEN (*Logik*) (40) unterscheidet übereinstimmende, ähnliche und gänzlich verschiedene Merkmale, symbolisch bezw. mit m, o, q bezeichnet. Für die Diagnostik haben nun im allgemeinen die q-Merkmale, für die Typologie die m-Merkmale, die grösste Bedeutung. Aber von „wesentlich" darf man dabei noch nicht reden. „Wesentlich" im Sinne der

1) Man muss aber dabei erwägen, dass die Phylogenie der Methode nach keine Naturwissenschaft, sondern G e s c h i c h t s w i s s e n s c h a f t ist!

Logik ist das, was zur Unterscheidung dienen kann. An erster Stelle also die o- und q-Merkmale. Aber eine zweckmässige Definition kann nicht immer die unendliche Reihe all dieser Merkmale ausdrücken. Es kommt dann darauf an eine Auswahl zu treffen. Für diese Auswahl aber gibt es keine allgemein-gültige logische Regel. Es gibt also keine „absolut wesentlichen'' Merkmale. Der Zweck der Untersuchung (hier das „natürliche'' System) spielt eine entscheidende Rolle. Man kann daher nur sagen: Welche Merkmale sind in Bezug auf die zum Aufbau des natürlichen Systems notwendigen Unterscheidungen wesentlich?

Die Frage nach Substanz und Akzidenzien, nach wesentlichen und unwesentlichen Merkmalen, hat nun immer als Grundfrage der Systematik gegolten. Die Antwort auf diese Frage aber steht zu jeder Zeit in engem Zusammenhang mit der damaligen Situation der Wissenschaften.

Gerade die beiden Botaniker CESALPIN und RAY, denen wir den historischen Teil dieser Arbeit widmen, unterscheiden, vielleicht von ihrem metaphysischen Standpunkt geführt, absolut wesentliche und akzidentelle Merkmale, indem sie versuchen eine *definitio essentialis* zu geben. Was sie in Bezug darauf ausgeführt haben, wollen wir in dem nächsten Abschnitt betrachten.

IV. Historisches.

Soll man die Anwendung des Substanzbegriffes in der Systematik untersuchen, so wählt man am besten diejenigen Botaniker, die sich der Prinzipien ihrer Systematik explizit Rechenschaft ablegen. Es ist kaum möglich aus blossen Tabellen oder Conspectus eine Idee von den leitenden Prinzipien zu bekommen. In diesem Aufsatz beschränken wir uns auf zwei ältere Forscher, auf CESALPIN und RAY. Sie gehören einem ganz verschiedenen Ideenkreis an, haben aber beide ein mehr oder weniger zeitgemässes philosophisches System, wodurch sich die theoretischen Auseinandersetzungen über ihre Klassifikation im Rahmen einer Philosophie, in welcher die Stellungnahme zum Substanzbegriff bekannt ist, betrachten lassen.

ANDREA CESALPINI (1519—1603) ist vielleicht der ausgezeichnetste Peripatetiker nach ARISTOTELES. ARISTOTELES steht vor ihm als die grosse Autorität, auf dessen Sätzen sich alle Philosophie und Wissenschaft überhaupt gründen lässt. Wenn er auch ergriffen ist von den modernen Ideen der neuern Zeit, die sich faktisch öfters denen des ARISTOTELES entgegenstellen, so wird die Autorität des Stagyriten dadurch nicht erschüttert, sondern sie bleibt ebenso fest gegründet, weil CESALPIN die neuen Tat-

sachen aus der Lehre des Meisters zu rechtfertigen versucht. Wenn auch autoritär sich an ARISTOTELES haftend, ist er ein Forscher von grosser Selbständigkeit, indem er sich einen eigenen ARISTOTELES schafft, frei von allem Ueberlieferten des Mittelalters. Dass er eben in dieser Zeit nicht auf Ketzerei verklagt worden ist, sondern vielmehr einen Ruf an den päpstlichen Hof erhalten hat, muss Verwunderung erregen.

Es wundert kaum, dass sich in den Arbeiten eines so konsequenten Aristotelikers fast überall Erörterungen über den Substanzbegriff finden lassen. Ausser medizinischen Arbeiten hat CESALPIN ein Buch über die Botanik geschrieben (7). Seine Erstlingsarbeit dagegen, die *Quaestiones Peripateticarum* (8, 9), eine Summa philosophiae — bis jetzt wenig beachtet — muss vielleicht als sein Hauptwerk betrachtet werden.

Bekanntlich ist das Pflanzensystem CESALPINS, obwohl ein durchaus künstliches, das erste System mit wissenschaftlichen Prinzipien. CESALPIN sieht das System der Pflanzen als höchstes Ziel der Botaniker: „die Einteilung der Pflanzen nach Unterschieden, welche die Natur des Dinges andeuten" (7, S. VI). Die Einteilung der Pflanzen soll nicht in irgendeiner beliebigen Weise geschehen, aber sie soll natürliche Verhältnisse andeuten. Die (damals sosehr üblichen) alphabetischen Systeme, die Einteilungen nach medizinalen Eigenschaften (DIOSKORIDES) oder Standorten (THEOPHRAST) sind daher zu verwerfen. Man soll zweckmässige Gattungen [1]) haben, denn ohne diese verwirrt sich alles; hat man etwas nicht in der zutreffenden Gattung untergebracht, so kann eben die genaueste Beschreibung irreführen. Eine natürliche Ordnung hat die grössten Vorteile, da sie am leichtesten im Gedächtnis zu behalten ist; ausserdem sind die Unterschiede so am auffälligsten, und werden die medizinischen Kräfte so am besten betrachtet. In diesem System kann man für alle Pflanzen, auch für die neuen, die entsprechenden Stellen sogleich ausfindig machen.

Die Grundsätze nun auf welchen ein solches System zu gründen ist, werden im zwölften und dreizehnten Kapitel des ersten Buches *De Plantis* erörtert. Es ist für einen Peripatetiker wie CESALPIN selbstredend, dass er dabei von den Substanzen ausgehen soll. „Wir suchen nun die Uebereinstimmungen und Verschiedenheiten der Formen, in welchen die Substanz der Pflanzen besteht, nicht derjenigen, die ihnen akzidentell

1) Wir bemerken noch, dass bei CESALPIN und RAY die Termini Art und Gattung immer in logischem Sinn angewendet werden. Erst bei LINNÉ tritt die jetzt in der Botanik übliche Bedeutung auf.

sind, denn die Akzidenzien werden erst später bekannt als die Substanz'' (d.h. sind logisch später als die Substanz) (7, S. 26). Heilkraft, Anwendung, Standort usw. sind nur Akzidenzien. „Der Seinsgrund der Substanz nun ist unbekannt, weil die äussersten Unterschiede unbekannt sind, und so meinen manche, dass man deshalb nach den Akzidenzien einteilen soll'' (7, S. 27). Das ist eben nicht peripatetisch, sagt ARISTOTELES ja: „Wenn nun der Unterschied unterschieden wird, so wird einzig der letzte die Form und die Substanz sein; teilt man aber nach akzidentellen Unterschiede ein, ..., so bekommt man so viele Unterschiede als Einteilungen'' (*Met.* VII, 12) (4). Man kann auch nicht die grösste Anzahl übereinstimmender Teile (Merkmale) als Einteilungsgrund nehmen, denn auf diese Weise werden kongenerischen Pflanzen oft voneinander entfernt, und wird die Bildung höherer Gattungen (*genera superiora*) unmöglich. Diese Sätze werden überdies in den *Quaestiones Peripateticarum* (8) (L. I, qu. 5) ausführlich erörtert. Wichtiger ist der Einteilungsgrund nach der aus der Seele hervorgehenden Form. Für die lebendigen Körper sind nämlich Seele und Substanz etwa gleichwertig. Man kann das der Schrift des ARISTOTELES *„Ueber die Seele''* (3) entnehmen, wo es z.B. heisst: „Also muss die Seele Wesenheit (Substanz) sein als Form eines natürlichen der Möglichkeit nach belebten Körpern''; und: „Die Seele ist nämlich das begriffliche Wesen, d.h. das eigentümliche Sein [Substanz] eines so und so beschaffenen Körpers'' (*Ueber die Seele*, II, 1) (3). Man könnte denken, dass in dieser Weise alle Pflanzen nur zu einer Gattung gehören könnten, weil sie alle aus einer selben *anima vegetativa* hervorgegangen sind. Dann sollten aber auch die Teile, welche die Funktionen eines bestimmten Teiles der Seele verrichten, bei allen Pflanzen nicht verschieden sein. Die Pflanzen sind aber verschieden; und so kommt CESALPIN darauf, dass es notwendig ist sie in Gattungen und Arten einzuteilen. Um zu diesem Ergebnis zu gelangen, wäre vielleicht die ganze vorangehende Erörterung überflüssig gewesen, sie hat jetzt aber zur Erwiderung einiger falschen Auffassungen dienen können.

Ein allgemeiner Satz nun ist, dass wenn eine Substanz ist, auch diejenigen Substanzen sind, welche den ersten zur Verfügung gegeben sind. Bei den Pflanzen soll das so aufgefasst werden, dass die Uebereinstimmungen und Verschiedenheiten sich in denjenigen Dingen finden lassen, die zu Gunsten der Funktionen der ersten Seele gegeben sind, zweitens in denen, welche zu Gunsten der Funktionen der zweiten Seele da sind, usw. — Die zwei wichtigsten Funktionen der vegetativen Seele sind in dieser Be-

ziehung: die Ernährung und die Fortpflanzung [1]). Die Ernährung einschl. Wachstum steht an erster Stelle. Zur Nährungsaufnahme und zum Wachstum dienen Wurzel und Spross. Aus ihrer Beschaffenheit sollen die Differenzen zur Einteilung in „erste Gattungen'' hervorgehen. Die Pflanzen mit harter „Substanz'' [2]) werden als Bäume und Sträucher bezeichnet. die mit zärterer „Substanz'' als Kräuter und Halbsträucher. Diese Differenz wird aus der Natur der gleichartigen Teile erlangt, die die ganze Pflanze zusammensetzen. Eine zweite Differenz ergibt sich aus dem Spross: Ist er einfach, so haben wir Bäume und Kräuter; ist er verzweigt, Sträucher und Halbsträucher. CESALPIN meint aber besser zu verfahren indem er diese zweite Differenz vernachlässigt, weil sie eine weniger klare Disposition gibt. Er kommt also schliesslich zu zwei höchsten Gattungen: *Arbores (incl. Frutices)* und *Herbae (incl. Suffrutices)*. — Man könnte nun aus den andern Unterschieden (wie Gestalt, Farbe usw.) dieser Teile der ersten Funktion eine weitere Einteilung erhalten, aber das ist nicht erlaubt, da dieses mittels der Organe der zweiten Funktion geschehen soll.

Die zweite vegetative Funktion ist die Generation des Gleichartigen, welche aber der Vollkommenheit nach die erste ist. Die Frucht und die Fruktifikationsteile sind dieser Fortpflanzung zur Verfügung gegeben. Da diese nicht allen Pflanzen, sondern nur den vollkommenern zukommt, sind sowohl im Geschlecht der Bäume als in dem der Kräuter niedere Gattungen nach der Aehnlichkeit und Verschiedenheit der Früchte aufzustellen. Merkwürdig ist die Bemerkung CESALPINS, dass nichts daran gelegen sei, ob die Gattungen wohl oder nicht mit Namen versehen sind, weil doch nur diejenigen einen Namen erhalten haben, welche von dem Menschen aus irgendwelchem Grunde benutzt werden.

Es gibt sonst keine weiteren als diese beiden Funktionen der vegetativen Seele, und deshalb auch keinen dritten Modus zur Zerteilung der

1) Nicht nur CESALPIN hat diese beiden Funktionen als wichtig fur das Leben anerkannt. Zeitgenossen und Nachkommen haben ofters auch diese beiden angefuhrt. In einer statistischen Zusammenstellung der für die Definition des Organischen angewendeten Modale hat A. MEYER diese beiden Funktionen als die häufigsten gefunden (18).

2) Wie bei ARISTOTELES selbst hat bei CESALPIN „Substantia'' zuweilen die Bedeutung Materie. Materie kann ὑποκείμενον sein. Man muss aber bedenken, dass Materie in Aristotelischem Sinn (also auch bei CESALPIN) nicht an erster Stelle etwas Stoffliches bedeutet, sondern Potenz (im Gegensatz zu Form = *anima* = Aktualität). — Hier bedeutet Substanz wohl etwa „Wesenheit'', die sich aber in diesem Fall auf Eigenschaften der Materie gründet.

höchsten Gattungen. Aber, wie CESALPIN bemerkt, „sind mit Recht viele Pflanzengattungen nach der Fruktifikationsweise aufgestellt. Denn in keinen anderen Teilen hat die Natur so viel Mannigfaltigkeit und Verschiedenheit der Organe gelegt, als in den Früchten zusammengebracht angeschaut wird'' (7, S. 28). — Nur diejenigen Funktionen der Seele, welche sich der Werkzeuge bedienen, können als Einteilungsgrund dienen: die Vernunftseele (νοῦς) des Menschen z.B. hat keine materiellen Organe, und deshalb gehören alle Menschen nur einer Spezies an, und geschieht die Einteilung (vielleicht besser: die Bezeichnung) nach den Akzidenzien. Dasselbe kann man bei gewissen Pflanzen einsehen, die der Spezies nach als verschieden aufgefasst werden. Es gibt also noch andere Einteilungsgründe als die der Substanzen, nämlich die der *propria* [1]), die für die Fruktifikation vorhanden sind.

Nicht jede Pflanze ist im Stande sich fortzupflanzen: die Unvollkommenern, die der inorganisierten Welt am nächsten stehen (z.B. *Fungi*) können ihres Gleichen gar nicht erzeugen (entstehen durch *generatio spontanea*), können also nur wachsen und sich ernähren [2]). Andere Pflanzen scheinen wohl Samen zu produzieren, jedoch in unvollkommener Weise (so wie unter den Tieren das Maultier), meistens sind das Degenerationen und Krankheiten anderer Pflanzen. Man soll aber die vollkommenen Pflanzen, die steril sind, nicht in diese Klasse einordnen, kommt die Unvollkommenheit ja hier nicht der Spezies zu, sondern dem Individuum [3]); das Vermögen eine Frucht auszubilden ist also potenziell anwesend. Die übrigen können also nach der Beschaffenheit der Frucht eingeteilt werden. Die Gründe dazu sind für unsere Betrachtungen weniger wichtig. Sie werden im 14. Kapitel erörtert. Hier sei noch bemerkt, dass CESALPIN unter den Organen ausserhalb der Frucht solche unterscheidet, die *per accidens* da sind, d.h. die nichts mit der Frucht zu schaffen haben, und solche die *per se* da sind, d.h.

1) *Proprium* (Eigentümlichkeit) ist, nach ARISTOTELES (*Topik*), was zwar nicht das Wesen eines Dinges bezeichnet, aber nur ihm zukommt und in der Aussage mit ihm vertauscht wird. Nach PORPHYRIUS (*Einl. z. d. Kateg.*) (22) unterscheidet sich das Proprium von Differenz und Akzidenz dadurch, dass es nur eine gewisse Art innewohnt. („Das Proprium aber gilt nur von einer Art, deren Proprium es ist'', a. W. XIII).

2) Man vergleiche LINNÉs Satz: Lapides crescunt, vegetabilia crescunt et vivunt. Animalia crescunt, vivunt et sentiunt (*Phil. bot.* N. 3), die übrigens rein Aristotelisch ist!

3) Vgl. unten bei RAY, S. 177.

die in irgend einer Weise der Ernährung, Verbreitung oder dem Schutz der Frucht dienen. Letzteren dienen dann (mit denen, die aus der Fruktifikation selbst hervorgehen) der Einteilung in unteren Spezies. Die Merkmale, welche gar nicht der Konstitution der Pflanze oder Frucht dienen (Farben, Geruch, Geschmack) sind akzidentell, sie variieren durch äussere Faktoren. Die Merkmale, die *per se* da sind, sind unter allen Umständen gleich. Einige aber dieser (z.B. medizinische Eigenschaften) folgen der spezifischen Natur. Dies sind aber nach CESALPIN keine Differenzen, die die Substanz zusammenstellen.

Die eigentliche Einteilung der Pflanzen geht aus seinem Buch nur wenig deutlich hervor, für unsere Betrachtungen hat sie auch weniger Bedeutung; nur das Prinzip ist wichtig. Eine gute Uebersicht der Einteilung selbst gibt LINNÉ, *Cl. Pl* p. 3—31. Die Bäume werden von CESALPIN im zweiten und dritten Buch behandelt, die Kräuter in den Büchern IV—XVI.

Kurz gefasst kann man sagen, dass der Substanzbegriff CESALPINS sich dem des ARISTOTELES vor allem darin anschliesst, dass er als Träger der akzidentellen Eigenschaften betrachtet wird. Die Begriffe der Substanz und der Seele aber sind eng mit einander verwandt, was auch sehr Aristotelisch ist (Vgl. *Ueber die Seele*) (3). In dieser Hinsicht könnte man die Substanz am besten als *causa materialis* der Seele (teleologisch) auffassen: sie ist zugunsten der Seele gegeben. CESALPIN hat sogar in einem Caput der *Quaestiones peripateticarum* (8) die Bedeutung der Substanzen auf die lebendigen Körper beschränkt!

JOHN RAY (JOANNES RAIUS, 1628—1705) ist zweifelsohne der prominenteste Botaniker Englands im XVII. Jahrhundert. Vielfach wird MORISON grössere Originalität zugeschrieben, aber demgegenüber steht, dass RAY den grössten Einfluss auf seine Zeitgenossen und Nachkommen ausgeübt hat. Dazu kommt noch, dass RAY auch auf anderen Wissensgebieten erfolgreich arbeitete, und speziell in der Zoologie und Botanik grössere Werke verfasst hat, die das ganze XVIII. Jahrhundert hindurch ihren Wert als Nachschlagebücher bewahrt haben. Für unsere Betrachtungen haben wir aus den theoretisch ausgebildeten Systematikern, die für eine bestimmte Epoche (und hier auch für einen bestimmten Volkscharakter) bezeichnend sind, RAY zur Besprechung gewählt. Das theoretische Interesse verdankt RAY vielleicht seiner literarischen Veranlagung und daneben noch seiner theologischen Ausbildung. In dieser Hinsicht steht er auf der Grenze zweier wissenschaftlichen Methoden: des über-

lieferten Aristotelismus und des Empirismus. Aus ersterer geht seine Verknüpfung mit der Vergangenheit und seinen Präzeptoren hervor; in seinem Empirismus beweist er seine Landesart als Engländer. In dieser Beziehung hat er eine gewisse Uebereinstimmung mit seinem Zeitgenossen JOHN LOCKE (1632—1704), dessen philosophische Ansichten gleich dargestellt werden. Soweit uns bekannt ist, sind die methodischen Aehnlichkeiten RAYS und LOCKES, die in einigen Fällen auch zu denselben Fehlschlüssen führen, niemals hervorgehoben worden. Es ist dem Verfasser nicht bekannt ob RAY und LOCKE sich Zeit ihres Lebens persönlich oder schriftlich kannten. In der von der RAY-society ausgegebenen Korrespondenz RAYS (27, 28) und in seiner Biographie (26) wird LOCKES Namen in diesem Zusammenhang nicht erwähnt.

Der Verfasser ist geneigt zu denken, dass dieser Parallelismus sich in der Tatsache gründet, dass LOCKES Erkenntnistheorie weniger eine Neuschöpfung, als eine Wiedergabe der herrschenden zeitgemässen Ansichten seines Volkes ist.

Bevor wir nun RAYS systematische Prinzipien einer Besprechung unterwerfen, geben wir eine kurze Erörterung der Philosophie LOCKES, soweit sie für unsere Betrachtungen wichtig ist. LOCKE (16) findet den Ursprung aller Erkenntnis in der E r f a h r u n g; weil er dabei den Nachdruck auf unsere Sinneswahrnehmungen legt, hat man seine Philosophie wohl als S e n s u a l i s m u s bezeichnet. Die Tatsachen der Erfahrung werden der äusseren und inneren Wahrnehmung (*sensation* und *reflexion*) entnommen. Nur erstere gibt uns die Erkenntnis der uns umgebenden Welt, nämlich in der Form der primären und sekundären Qualitäten. Aus der Erfahrung bekommen wir die s.g. einfachen Vorstellungen (*simple ideas*). Diese einfachen Vorstellungen sind Eindrücke, die die Aussenwelt auf den Geist einprägt, bei denen der Geist also gänzlich p a s s i v ist. Daneben gibt es zusammengesetzte (*complex ideas*), die durch die Wirksamheit des Geistes aus den einfachen Vorstellungen hergeleitet werden. Da LOCKE nur den Erfahrungstatsachen Wirklichkeit zuerkennt, sind diese zusammengesetzten Vorstellungen blosse Abstraktionen. In dieser Beziehung ist LOCKE Nominalist, weil er unsere Wörter nur als Zeichen für unsere Vorstellungen, aber nicht für die Dinge selbst betrachtet. Die Natur schafft die Individuen, die der Mensch mittels der von ihm selbst erdachten Gattungsbegriffe einteilt. Zu diesen zusammengesetzten Vorstellungen gehören auch die der Substanzen (*complex ideas of substances*). Die Substanz nach der Auffassung LOCKES ist ein unbekanntes Prinzip, dessen Wirkung wir erkennen können, von welchem

wir aber nicht wissen, was es ist. Die Substanz bewirkt, dass wir bestimmte einfache Vorstellungen immer verbunden zu einer Einheit erfahren. In diesem Sinn ist also Substanz = Substrat, Träger der Akzidenzien. Nur letztere werden uns bekannt, weil sie die einfachen Vorstellungen hervorrufen. Indessen kann man der Substanz eine gewisse Realität nicht absagen: diese ist ektypisch (= abbildlich), weil sie die Verknüpfung der einfachen Vorstellungen genau so gibt wie sie erfahrungsgemäss verbunden in der Natur vorkommen. Nun kommt LOCKE alsbald auf den Begriff des Nominalwesens (*nominal essence*). Nehmen wir eine bestimmte Gruppe von Qualitäten zusammen unter einer abstraktiven zusammengesetzten Vorstellung (*abstract complex idea*), so hat diese die Bedeutung einer Essenz: z. B. gelbe Farbe, Schmiedbarkeit, Löslichkeit in Königswasser, usw. bilden die „Essenz'' des Goldes, d.h. desjenigen, das wir mit dem Namen Gold belegen. Diese Nominalessenz wird von dem Geiste gebildet, deshalb ist sie veränderlich, denn man kann noch eine beliebige Anzahl Eigenschaften hinzufügen, ohne dass der ganze Vorrat dieser Eigenschaften erschöpft wird. Das Realwesen (*real essence*) entzieht sich der Erkenntnis, es ist die Grundlage aller Eigenschaften, die in der Nominalessenz zusammengebracht sind, und regelmässig mit ihr vorkommen [1]). Diese Realessenz wird wahrscheinlich etwa in atomistischer Weise gedacht: wenn wir die kleinsten zusammensetzenden Teile der Körper in ihren primären Eigenschaften erkennen könnten, würde sich zweifelsohne eine Auflösung der sekundären Eigenschaften (Akzidenzien) der Körper ergeben. Obwohl die Realessenz unbekannt ist und bleiben wird, kann man ihr näherkommen durch die Erkenntniss der Nominalessenz, die indessen immer nur ein unvollständiges Abbild des Realwesens ist. In Bezug auf die Realessenz ist LOCKE wieder Realist. Dieser Widerspruch ist einer der vielen die sich in seinem *Essay* finden!

Man mag über LOCKE denken wie man will: er hat, wie DE SOPPER (31) bemerkt, das Wort seiner Zeit gesprochen. Er ist ein typischer Philosoph der „*common sense*'', und hat dadurch einen grossen Einfluss ausgeübt, während die Widersprüche seines Systems weniger beachtet wurden. In dieser Beziehung braucht es nicht zu wundern, dass wir Sätze LOCKES oft fast wörtlich bei vielen Forschern wiederholt finden.

1) Gleiches sagt etwa auch RAY, *Hist. Pl.* I, cap. XXVI (24), wo es heisst, dass wohl niemand mit einem Blick alle zur Vergleichung notwendige Uebereinstimmungen und Verschiedenheiten umfassen kann.

Wir wenden uns nun dem Botaniker RAY zu, und wählen als Ausgangspunkt seine *Dissertatio nova de variis Plantarum Methodis* (25). Gelegentlich kommen wir noch über seine andern Arbeiten zu reden. Schon in den Anfangssätzen der *Dissertatio nova,* wo steht, dass in der Natur nur Individuen existieren und dass es Begriffe (Universalien) nur im Geiste des Menschen gibt, ist eine Parallele zu LOCKES Ansichten zu ziehen. Das zweite Kapitel (*Ueber die kennzeichenden Merkmale der Gattungen*) fängt sogar mit der Bemerkung an, dass das Wesen (Essenz) der Dinge uns unbekannt sei, und dass all unsere Erkenntnis aus den Sinnen hergeleitet werde. Wir wissen nichts von den Dingen ausser uns als das, wodurch sie unsre Sinne zu reizen vermögen: die „Eindrücke'' rufen in unserm Geiste bestimmte Vorstellungen auf, usw. Der Gesichtssinn, der unter allen Sinnen der feinste ist, ist nicht im Stande uns die kleinsten Teilchen der Körper zu offenbaren, was z.B. für die durchscheinenden Körper sogleich einleuchtet

Weil die Essenzen unbekannt sind, können wir auch die wesentlichen Gattungsmerkmale nicht ermitteln. Hier ergibt sich sofort einen Anschluss an LOCKES Nominalismus. Man könnte hieraus schliessen, dass eine natürliche Klassifikation gar nicht möglich sei: hier macht RAY jedoch einen gleichen Notsprung wie LOCKE, indem er annimmt, dass die Uebereinstimmung möglichst vieler Akzidenzien wohl doch auf ein wesentliches Zusammengehören hinweisen wird. Es fragt sich hier aber, welche Teile der Pflanzen man als die essentiellen betrachten muss. Dabei stellen RAY und LOCKE dieselben Ansprüche an die Essenz: sie soll beharrend, und immanent sein. Deshalb kann die Essenz ihren Sitz nicht in der Blüte oder Frucht haben: es gibt zu viele Pflanzen, die diese ganz vermissen, und zu viele (z.B. Bäume), die diese erst spät ausbilden. Auch die P o t e n z, Blüte und Frucht ausbilden zu können, kann man nicht als Essenz betrachten [1]), denn diese ist etwas Unsichtbares und nicht durch die Sinne Wahrnehmbares. Die Essenz muss aber zu jeder Zeit wahrnehmbar sein, denn sonst könnte man nicht wissen welche Art man vor sich hat [2]) (Beispiel des Nussbaumes). Hier voll-

1) CESALPIN hat diesen Einwand gerade als unwichtig beseitigt.

2) Wie bei LOCKE scheint hier der Name Ausdruck einer Essenz (des Nominalwesens) zu sein. Merkwürdig ist, dass LOCKE das dritte Buch seines *Essays* der Sprache und deren Einfluss auf das Denken widmet, während RAY in dem ersten Kapitel (*Vom Ursprung und Fortschreiten der „Methode''*) der *Dissertatio nova* ausführt, dass die Sprache und „Methode'' beide ihren Ursprung im „Namengeben'' finden!

zieht sich allmählich ein Umschwung zum Realismus, der in dem Vorworte der *Dissertatio* vollzogen ist. Obwohl RAY zustimmt, dass die Universalia Bildungen des menschlichen Geistes sind (*post rem*), so kann er nicht leugnen, dass sie ihre Grundlage in den Dingen („*in re*") haben! Die Individuen einer und derselben Spezies scheint der göttliche Geist nach einer selben Idee (oder Vorbild) geschaffen zu haben (*universalia ante rem!*). Das war die Arbeit der Schöpfung am Anfang der Welt. Von jener Zeit an geben die Samen die spezifische Form immer auf die gleiche Weise weiter (Samen sind kleine Pflänzchen, mit der Mutterpflanze verwandt, aber ohne Kontinuität mit dieser). Die spezifischen Essenzen werden also als materielle unteilbare Partikeln (wie λόγοι σπερματικοὶ !) weitergegeben (Vgl. S. 183). Eine derartige spezifische Konstanz behauptet er *Hist. Pl.* I, cap. XX, als er bemerkt, dass Gott am sechsten (!) Tage von seinem Werke, d.h. von der Schöpfung neuer Spezies (!), ausgeruht habe, und deshalb die Anzahl der Spezies beschränkt sei. Indessen ist RAY von der fortwährenden Entstehung neuer Formen überzeugt. Aber auf Grund des angeführten Gesichtspunktes kann er diesen keinen spezifischen Wert zuerkennen. Es sind eben meistens Varietäten, oder Spielformen, die er als Beispiele anführt. Man kann in dieser Beziehung gerade den Satz, dass die Natur keinen Sprung mache, und von einem Extrem nur über die Mitte nach dem anderen gehe, nicht etwa als ein Hindeuten auf die Deszendenztheorie betrachten. Er ist bloss der Ausdruck dafür, dass es keine scharfe Speziesunterscheidung gibt. Nach LOCKE kann die Unveränderlichkeit der Essenzen nur so lange aufrecht erhalten werden, als derselbe Name dieselbe Bedeutung haben kann. RAY meint auch, dass die Veränderung der Dinge neue Namen mit sich führen wird, man darf das aber unserer Meinung nach nicht dynamisch auffassen. Es handelt sich hier, wenigstens bei LOCKE, nur um Vorstellungen, die sich ändern! PFLEIDERER bemerkt dazu, dass das „der ächt englische, zuerst *logisch metaphysische*, dann naturwissenschaftliche Darwinismus" [1]) sei.

Wie CESALPIN, versucht auch RAY die überlieferte Haupteinteilung in Bäume und Kräuter zu begründen. Er hat aber, seinem verschiedenen Standpunkte gemäss, ganz andere Argumente. Einerseits gilt ihm hier die Uebereinstimmung mehrerer Attribute, andererseits die „sichere und augenscheinliche" Merkmale, welche von jedem Botaniker anerkannt werden. Das ist eben ein Argument des „gesunden Verstandes". —

1) Zitiert nach DE SOPPER (31), S. 60. Kursivierung von uns.

Trotz seiner früheren Einwände behält er diese Einteilung bei. Was die weitere Ausbildung des Systems anbelangt, kann er diese nur mittels der Akzidenzien erreichen. In dieser Hinsicht ist seine Behauptung, dass aus derselben Essenz dieselben Attribute hervorgehen, wichtig. Gewissermassen ist das eine Folgerung der Substanzenlehre LOCKES, wo nämlich auf die Existenz einer Nominalessenz durch das anhaltende Verbundensein mehrerer Attribute geschlossen wird. Der Nominalessenz liegt nun die Realessenz zugrunde, und diese wird als die „Ursache'' der Akzidenzien betrachtet. Wir müssen also die Pflanzen zusammennehmen, welche die meisten Akzidenzien gemein haben, und das sind die, welche ähnliche Gestalt und Textur haben (*facies, habitus et textura*). Das Gesamtbild, etwa als Summe der Akzidenzien aufgefasst, steht im Vordergrund. Indessen bemerkt RAY, dass Blüte und Frucht gerade doch zur Einteilung angewandt werden können, weil diese sich bei den Pflanzen, die in den meisten Eigenschaften übereinstimmen, sehr konstant verhalten. Ein wichtiges Beispiel für dieses Verfahren bietet die Gruppe der Doldengewächse: das von RAY erstgenannte Merkmal ist die Dolde (*florum et seminum situs*); weiterhin aber stimmen alle diese Pflanzen durch die zusammengesetzten und zerstreut stehenden Blätter überein, und erst am Schluss erörtert RAY die Uebereinstimmung von Blüte und Frucht.

Wir lassen die weiteren Ueberlegungen RAYS unerörtert, weil sie für unsere Frage weniger wichtig sind. RAY selbst ist davon überzeugt, dass sein System, das sich indessen Zeit seines Lebens mehrmals geändert hat, viele Unvollkommenheiten hat; einerseits sind diese nach recht empiristischer Weise darauf zurückzuführen, dass die Natur sich nicht in einem System zwingen lässt: das wird durch die „anomalen'' Pflanzen gezeigt; andrerseits aber ist RAY der Meinung, dass die kurze Lebensdauer und die Unzulänglichkeit des menschlichen Geistes es nicht gestatten, das natürliche (d.h. von der Natur gegebene) System zu erfassen. Durch all seine theoretischen Arbeiten geht, wie bei LOCKE, der Widerspruch, zu dem jeder empiristische Forscher, der an noch etwas anderes als an die Empirie glaubt, kommen muss.

V. Betrachtungen über einige modernen Theorien.

Es fragt sich ob in der modernen Systematik etwas ähnliches wie der Substanzbegriff zu finden sei. Wir weisen zunächst auf den dritten Abschnitt dieser Arbeit hin, wo schon einiges über die gegenwärtige Lage der Systematik erörtert worden ist. Die Situation ist jetzt derart,

dass die Grundfragen der Systematik sich nicht getrennt von den anderen Disziplinen der Botanik, wie Genetik, Deszendenztheorie, Phylogenie, Oekologie, Physiologie usw. untersuchen lassen. Ja, die Behandlung bestimmter Grundfragen wird sogar von einigen dieser Wissenschaften mehr in Anspruch genommen als von der Systematik selbst, z.B. die des Artproblems von der Genetik. Nun mag z.B. A. MEYER, der sich auf streng logischen Standpunkt stellt, behaupten, dass der systematische Artbegriff nicht identisch mit dem genetischen ist, für unsere Betrachtungen genügt — was A. MEYER auch zustimmt — dass beide in den meisten Erörterungen aufs engste verknüpft und öfters begrifflich ungetrennt vorkommen. Im Folgenden haben wir uns also nicht bloss der Systematik zuzuwenden, sondern auch der Genetik, usw. um zu wissen in wie weit substanzielle Begriffe für die Systematik von Bedeutung geworden sind oder Bedeutung bekommen können. Dabei wird vielleicht die Systematik selbst etwas in den Hintergrund geraten, das ist aber nicht schlimm, da diese Fragen für die Prinzipien der Systematik von grosser Wichtigkeit sind. Wir wollen uns dabei so wenig wie nur möglich auf Diskussionen über den Artbegriff einlassen, obwohl das Problem in diesem Zusammenhang kaum gänzlich zu umgehen ist.

In Bezug auf den Substanzbegriff sind die grundlegenden Betrachtungen CASSIRERS in seinem *„Substanzbegriff und Funktionsbegriff"* von ausserordentlicher Wichtigkeit. CASSIRER zeigt, dass das logische Verfahren in den Naturwissenschaften besonders was die Physik betrifft, sich im Wandel der Zeiten fundamental geändert hat. Die moderne Physik seit GALILEI bemüht sich nämlich sich von dem Substanzbegriff und der abstraktiven Klasseneinteilung los zu machen. Dabei ist wesentlich, dasz der einzelne Fall, der in der Aristotelischen Physik in irgend einer Klasse untergebracht wurde, jetzt unter eine bestimmte Regel kommt. Laut, Licht, Elektrizität, z.B. früher als getrennte Klassen bestimmter Erscheinungen betrachtet, fallen jetzt unter denselben Schwingungsgesetzen. KEPLERS Gesetzen der Planetenbewegung und das Fallgesetz GALILEIS wurden von NEWTON unter dieselbe Regel, die der allgemeinen Gravitation gebracht Diese allgemeinen Regeln lassen sich nicht durch Abstraktion gewinnen, sondern sie werden in deduktiver Weise hergeleitet, und nachher mit den Tatsachen verifiziert. Statt durch ein Abstraktionsschema wird das Bild der Wirklichkeit durch ein Konstruktionsschema, d.h. durch eine begriffliche Neuschöpfung (NATORP) aufgebaut. Wird durch Deduktion nun ein solches Konstruktionsschema entworfen, so tritt das Reihenprinzip an die Stelle

des Klassenprinzips. Die Methode der Klasseneinteilung durch Abstraktion (= Abzug) der jedesmal akzidentellen (= unwesentlichen) Sachen führt schliesslich zu der Annahme einer Substanz. Dann bleibt nämlich die durch Abstraktion erhaltene substanzielle Identität als gemeinsamer Eigenschaftskomplex aller zu irgend einer Klasse gehörigen Individuen. Die (jedenfalls gedankliche) Konstruktion der Wirklichkeit ist aber nur möglich, wenn ein bestimmter Tatsachenbestand unter eine Regel gebracht wird, also als eine mathematische Funktion betrachtet wird. Auf diese Weise kommt Cassirer zu seinem Reihenprinzip.

Das Beispiel einer mathematischen Reihe mag nun der Unterschied dieser beiden Methoden veranschaulichen. Nimmt man als gegeben die Reihe der Quadraten der natürlichen Zahlen, 1, 4, 9, 16, 25, 36, ... usw., so ergibt eine einfache Betrachtung dieser Reihe, dass die Differenzen der aufeinander folgenden Termini eine neue arithmetische Reihe bilden, nämlich die der unebenen Zahlen. Durch Abstraktion und Extrapolation kann man jetzt die folgenden Termini einfacherweise berechnen. Man kann aber in diesem Fall auch auf eine schlichte Weise durch Deduktion zur Konstruktion der Reihe gelangen Denn es zeigt sich, dass der Unterschied zweier aufeinander folgender Termini in der Formel $(n + 1)^2 - n^2 = 2n + 1$ ausgedruckt werden kann. Ohne diese Formel hätte man aber bei dem induktiven und abstraktiven Aufbau der Reihe keinen allgemein-gültigen Zusammenhang finden können.

In seinen glänzenden Untersuchungen über den Funktionsbegriff hat nun Cassirer dargetan, dass in allen Gebieten der Naturwissenschaft eine Tendenz zur Elimination der substanziellen Begriffe zu finden ist. Freilich gilt das unbedingt für die Physik und Chemie, für die Biologie aber unserer Meinung nach nur in so weit hier die physikalisch-kausale Betrachtungsweise zur Anwendung kommt, d.h. in der Physiologie (im weitesten Sinne). Die Geschichte des Substanzbegriffes in der Philosophie gibt eine merkwürdige Parallele zu diesem Entwicklungsgang (vgl. z.B. Ritter) (29).

Es fragt sich ob diese Funktionsbegriffe auch irgendwo sonst in der Biologie angewandt werden können. Wir denken dabei zunächst an die Systematik und bemerken, dass vor allem die romantischen Systematiker (Oken, Fries, z.B.) im Anfang des 19. Jahrhunderts versucht haben zu konstruktiven Systemen zu gelangen [1]). Die Prinzipien dieser Systeme

1) Man vergleiche: Systemata philosophica non ad naturae productuum individua, quae continuae varietati obnoxia, sed ad ideas aeternas et immutabiles

führten zu einer Einteilung in eine beschränkte Anzahl Klassen, in welchen man sich die Merkmale immer als besondere Ausprägungen bestimmter Organeigenschaften vorstellte, nämlich ungefähr wie das Verhältnis einer mathematischen Funktion zu seinem Argument. Die Anzahl dieser Funktionen war beschränkt und dadurch war nur eine beschränkte Anzahl Arten möglich. Die Möglichkeit bestand irgend welche Lücken im System später auszufüllen und die wahrscheinliche Existenz bestimmter Formen vorauszusagen. Diese überaus künstlichen Systeme sollen hier aber nicht weiter besprochen werden: ihre Grundlage war allzu spekulativ, und ausserdem haben sie nicht zu wichtigen Ergebnissen geführt.

Weitaus wichtiger ist für uns die in neuerer Zeit von DRIESCH hervorgehobene Unterscheidung der rationellen Systematik. Diese muss, nach DRIESCH (10, S. 246—247), „auf einen Begriff begründet sein, mit dessen Hilfe eine Gesamtheit spezifischer Verscheidenheiten verständlich wird; d.h. jedes System, welches behauptet, rationell zu sein, muss uns einen Schlüssel geben, mittels dessen wir imstande sind zu begreifen: entweder, dass nur eine bestimmte Zahl von Artverschiedenheiten einer gewissen Gattung existieren kann, oder dass zwar eine unbegrenzte Zahl solcher Verschiedenheiten möglich ist, die aber einem bestimmten Gesetz mit Rücksicht auf die Natur ihrer Unterschiede folgen". Gute Beispiele einer solchen rationellen Systematik finden sich in der Mathematik; Physik und Chemie sind so weit noch nicht, aber zeigen schon die Anfänge solcher Klassifikationen, z.B. das periodische System der Elemente und die homologen Reihen von organischen Verbindungen der Chemie. Es leuchtet ein, dass diese rationelle Systematik als Grundlage das Reihenprinzip (Funktionsbegriff) CASSIRERS hat. Jeder Terminus steht in funktionellem Zusammenhang mit den Anfangstermini der Reihe. Die Termini selbst haben keine substanziellen Eigenschaften, die ihnen einen wesentlichen Charakter verleihen, wie man es sich in der älteren Chemie (und Alchemie) dachte. Der wesentliche Charakter der Elemente ist durch ein quantitatives Bild ersetzt, das aber bei der Erwähnung einer Formel (= Zeichen) (z.B. Pb) nicht immer explizite ausgedrückt zu werden braucht. In einem solchen „periodischen" System mit funktionellem Zusammenhang der Komponenten kann nicht

attendunt. Haec semper a centro egrediuntur ad peripheriam l. a perfectissimo ad inferiora ...... — Cum mathematico convenit, seriem si invertas...... — Systema philosophicum ceteris antecellit. (FRIES, *Syst. Orb. Veg.* (12), p. 16—17).

nur die Möglichkeit des Bestehens bestimmter Elemente vorausgesagt werden, sondern ist es sogar möglich die wichtigsten Eigenschaften solcher Elemente im Voraus anzudeuten, wie z.B. die Geschichte der Entdeckung des *Germaniums* gezeigt hat.

Wir wollen nun wissen, in wie weit die neuen physikalischen und erkenntnistheoretischen Gedanken, wie sie von CASSIRER erörtert wurden, auf die moderne Biologie anwendbar sind. Es hat sich vielleicht nie eine fundamentalere „Umwertung der Werte'' in der Biologie ergeben als der wesentlich von DARWIN hervorgerufenen Deszendenzgedanke. Neben dem Prinzip, dass alle Organismen eine kontinue Reihe bilden, welche uns mehr oder weniger lückenhaft bekannt worden ist oder werden kann, steht als zweites, der nicht weniger wichtige Begriff der Pangenesis. Von DARWIN gegründet, von DE VRIES weitergeführt, hat dieser Begriff in der modernen Genetik durch die Schulen MORGANS und GOLDSCHMIDTS eine ausserordentlich hervorragende Bedeutung erhalten. Beide Teile dieser Theorie, Deszendenz und Pangenesis, stehen in ziemlich enger Beziehung zu einander und zur Systematik. Aber speziell die Pangenesis ist für unsere Betrachtungen von grösster Bedeutung. Durch diesen Begriff wird die Auffassung der „Merkmale'' fundamental geändert. Unter Pangenesis ist nämlich zu verstehen, dass jede besondere Ausprägung eines Merkmals zustande kommt unter Wirkung eines oder mehreren Pangene oder Gene [1]). Wie verschieden die Auffassung von der Art und Wirkungsweise der Gene bei den Autoren auch sein mag, man denkt sie doch meistens als stoffliche Agenzien [2]), welche durch ihre Wirkung eine bestimmte Farbe, Behaarung, oder irgend ein anderes „Merkmal'' hervorrufen. Nicht bloss das Merkmal sondern auch der ganze Organismus wird hierdurch anders aufgefasst. Die Theorie der Pangenesis öffnet die Möglichkeit zu einer physiologischen (d.h. in Wesen physikalischen) Auffassung der Vererbung und der Formwerdung

1) Ueber die methodische Notwendigkeit einer Annahme solcher „Protobionten'' vergleiche man N. HARTMANN (15, S. 76 ff.).

2) Der Begriff der Pangenesis ist vielleicht schon bei RAY angedeutet, indem er sagt: ...... sequitur, species hasce a se invicem essentialiter distingui, et intransmutabiles esse, earumque formas sive essentias, vel principia quaedam sui generis esse, hoc est particulas quasdam minimas materiae, ab omnibus aliis distinctas et naturaliter indivisibiles, vel λόγους quosdam σπερματικοῦς idoneo sui generis veheculo inclusos (*Diss. nova, Praef.*). Man muss sich aber davor hüten RAY auf allzu moderne Weise interpretieren zu wollen!

des Organismus. Die Analyse des Organismus (ebenso wie die eines physikalischen Prozesses) lässt die theoretische Rekonstruktion des Organismus aus den in dieser Weise festgestellten Elementarprozessen zu. Die von GOLDSCHMIDT z.B. ausgeführte Analyse der Intersexualität führt ihn (ob zwingend, lassen wir hier dahingestellt sein) zu der Annahme enzymatischer Prozesse, wodurch eine physiologische Theorie zu Stande kommt. In einer solchen Theorie kann man gewisse physiologische Prozesse durch rein chemisch-physikalische ersetzt denken, wodurch man sich dem von CASSIRER angeführten „Konstruktionsprinzip'' nähert. Wie ein bestimmter physikalischer Prozess, ausgehend von Atomen, Molekulen und ihren Eigenschaften synthetisch konstruiert werden kann, so soll nach dieser Auffassung auch der Organismus letzten Endes (wenigstens prinzipiell) in einem schematischen Bilde konstruiert werden können [1].

Es fragt sich — und das ist (wie PLATE hervorhebt) teils auch die alte Frage der Evolution oder Epigenesis — ob das Entstehen des ganzen Organismus durch die Arbeit dieser Gene gedacht werden muss. Und weiter, in wie weit diese Gene sich nach mendelistischer Art austauschen lassen. Es ist bekannt, dass wir von etwaigen „Gene'', die nicht nach mendelistischer Art spalten, gar wenig wissen, vielleicht auch weil der Begriff „Gen'' in diesem Fall nicht recht deutlich feststellbar ist. Die ursprünglich von DE VRIES in seiner *Intracellulare Pangenesis* vertretene Theorie besagt, dass der g a n z e Organismus durch die Arbeit solcher P a n gene zustande kommt. Späterhin hat man die Definition der Gene in soweit umgeändert, dass man auf das Bestehen bestimmter Gene nur noch nach einer erfolgreichen Mendelanalyse schliesst. Es ist nun eins der Ergebnisse der modernen Genetik, dass sie dargetan hat, dass nicht alle Eigenschaften oder Merkmale eines organischen Körpers in dieser Weise zu analysieren und auf Genwirkung zurückzuführen sind. — Einige der Theorien, die sich hiermit beschäftigen, wollen wir einer kurzen Besprechung unterwerfen. Wir wenden uns zuerst

1) Es soll darauf hingewiesen sein, dass es hier nicht um tatsächlichen synthetischen Aufbau der Lebewesen handelt. Gerade NEWTONS astronomisches Weltbild ist ein gutes Beispiel der mathematisch-physikalischen Konstruktion. Es ist bloss „gedanklich'' konstruiert. Denn obwohl in der Astronomie dieser Konstruktionsbegriff einwandfrei berechtigt ist, wird wohl niemand daran denken, dass es einst möglich sein wird sich ein ähnliches Sonnensystem wie das der Astronomie synthetisch aufzubauen. Die Frage nach der Möglichkeit eines tatsächlichen synthetischen Aufbaus der Organismen ist vielleicht wohl unauflöslich.

VAVILOVS Theorie der homologen Reihen zu, weil diese eine eigentümliche Zwischenstellung einnimmt, und in ihrer ursprünglichen Form ein abstraktives Klassifikationsverfahren aufweist.

Einer der wichtigsten modernen Versuche um zu einer rationellen Klassifikation zu geraten, ist diese Theorie der „homologen Reihen der Variation''. Sie besagt kurz, dass „Linneonten und Genera aus einer grossen Menge variabeler Unterschiede zusammengesetzt sind'', und dass diese Variabilität in nah verwandten Linneonten und Gattungen mehr oder weniger dieselbe ist. Hat man z.B. für eine Spezies (Linneon) A, variierende Merkmale an den Organen a, b, c, d, usw., so kann man in einer verwandten Spezies B gleichartige Variationen an den selben Organen erwarten. Eine Bestätigung findet die Theorie u. m. darin, dass es auf diese Weise gelungen ist, durch Analogieschlüsse unbekannte Varietäten, oder sogar Spezies vorauszusagen. Später wurden diese dann auch wirklich entdeckt. Nun ist es klar — wie VAVILOV selbst ausführt —, dass diese variierenden Eigenschaften (Merkmale) von keiner Bedeutung sind bei der Unterscheidung der Linneonten. Diese lassen sich nur unterscheiden durch „spezifische Komplexe morphologischer oder physiologischer Natur'', s.g. R a d i k a l e. So gibt es Radikale für Linneonten, andere für Gattungen, für Familien usw. Ueber die Natur dieser Radikale lässt VAVILOV sich nicht aus, er meint, dass sie von spezieller genetischer Natur sein könnten, aber dass unsere Kenntnis in dieser Beziehung noch zu gering sei. Die Systematik und Abgrenzung der Arten und Gattungen soll sich nun durch die Radikale ergeben. Vielfach lassen diese sich nur durch „Intuition'' feststellen. In manchen Fällen sind untaugliche Unterscheidungen zustande gekommen, indem man variierende Merkmalkomplexe mit den Radikalen vermischte.

Es ist möglich mittels dieses Begriffes des Radikals zu einer symbolischen Vorstellung der Gattungen, Spezies und Varietäten zu kommen. Wenn G_1, G_2, G_3, usw. die Radikale einiger Gattungen, L_1, L_2, L_3, usw. die Radikale einiger Spezies, und a, b, c, usw. variierende Merkmale der zu diesen Arten gehörigen Varietäten sind, so liessen sich die Spezies (Linneonten) unter der Formel $GL\,(a + b + c + d \ldots\ldots)$ fassen, und so liesse eine bestimmte Varietät sich durch $G_1L_1\,(a_1b_1c_1\ldots\ldots)$, eine andere Varietät derselben Spezies durch $G_1L_1\,(a_2b_2c_1\ldots\ldots)$, eine „homologe'' Varietät einer Verwandten Spezies durch $G_1L_2\,(a_2b_2c_1\ldots\ldots)$ vorstellen, usw.

Diese Radikale sind in vielerlei Hinsicht mit den Aristotelischen Substanzen zu vergleichen. Erstens stimmen die variabelen Eigenschaften

(resp. Merkmale) a, b, c, usw. ganz und gar mit den akzidentellen Kategorien überein. Denn ob in einem bestimmten Individuum das Merkmal a rot ist, oder blau, oder gelb oder grün, ist einerlei: dennoch gehört das Individuum z.B. zu der Spezies *Triticum vulgare,* und das Radikal ist es, das dieses Individuum zur Spezies gehörig bestimmt. Fragt man, was es ist, das dieses Individuum zu dem macht, was es ist, so ist die Antwort: das Radikal. Und dies ist eben die Substanz (im Sinne der Essenz). Aber: in dem Radikal der Spezies muss auch das der Gattung mit einbegriffen sein, und weiter das der Familie, usw. Also: von dem Individuum wird die Spezies ausgesagt, von dieser wieder die Gattung, und von dieser wieder die höhere Gattung usw. Es berührt einen, als ob man hier ARISTOTELES selbst oder PORPHYRIUS reden hört. Man bedenke dabei, dass das Radikal VAVILOVS nicht ὑποκείμενον (Substrat) ist.

Das Radikal VAVILOVS ist eine typische Aristotelische Abstraktion. Obwohl es das „Wesen" eines Organismus als seiner Klassenzugehörigkeit andeutet, ist es dennoch kein ontologischer Begriff. Die Radikale sind Merkmalkomplexe, die nur phänomenal zu erfassen sind. Und die Frage nach dem „Was" des Radikals ist wohl nicht ganz unauflöslich (wenigstens prinzipiell). VAVILOV äussert sich gar nicht über die Natur seiner Radikale. Aber für den modernen Naturwissenschaftler ist es kein „letztes" Wesen. Man wird versuchen es in weitere Gründe zu zerlegen, und als solche wird man zunächst an irgendein physikalisch-chemisches System denken. Aber jetzt ist man noch nicht so weit diesen Begriff in Elementarbegriffe auflösen zu können. Deshalb sagt das Radikal VAVILOVS in seiner heutigen Form nur wenig aus; es ist aber ein vorzüglicher systematischer Begriff. Und gerade aus der Tatsache, dass es ein logischer Begriff ist, ergibt sich die treffende Uebereinstimmung mit der Aristotelischen zweiten Substanz.

Das Gesetz VAVILOVS kann, obwohl es selbst wesentlich „systematisch" (d.h. Aristotelisch) ist, vielleicht doch zu einer funktionellen Deutung bestimmter systematischer Probleme hinüberführen. Wiewohl hier die homologen Reihen empirisch-induktiv gewonnen sind, gibt eben die Existenz dieser Reihen den ersten Ansatz zu einer funktionellen Auffassung, die aber zur Zeit noch nicht rationell auszusagen ist. Ein wichtiger Fortschritt in dieser Richtung wurde von PHILIPTSCHENKO erreicht, indem er innerhalb des der Chemie entlehnten Begriffes der „homologen" Reihen VAVILOVS, den genotypischen, oekotypischen und morphologischen Parallelismus unterscheidet. Die beiden ersten Paral-

lelismen sind der genetischen [1]) Analyse (wenigstens prinzipiell) zugänglich, und vielleicht wird es auf dieser Grundlage möglich VAVILOVS „Gesetz'' zu einem allgemeinen „Grundgesetz der gruppenweise Variation'' [2]) zu erheben. Das Gesetz VAVILOVS in ursprünglicher Form besagt nur irgendeine Regelmässigkeit der Variabilität und ist als solches eben nur ein Klassifikationsprinzip.

Wie schon am Anfang dieses Abschnitts bemerkt wurde, hat DRIESCH den Begriff der rationellen Systematik eingeführt. Wir wollen jetzt kurz nachgehen in welcher Weise DRIESCH sich etwa vorstellt, dass die Biologie zu einer solchen rationellen Klassifikation gelangen kann. In dieser Hinsicht ist er sehr vorsichtig, indem er sagt zu „glauben'', dass das unbekannte transformistische Prinzip mit der Entelechie selbst verknüpft sei: „Die Systematik der Organismen würde alsdann eigentlich eine Systematik der Entelechien sein, und eben darum wären die organischen Formen „formae essentiales'', die Entelechie wäre die eigentlichen Essenz der Form in ihrer Spezifität. Das System würde in diesem Falle natürlich einen wahrhaft rationellen Charakter in Zukunft annehmen können: eines Tages könnte ein Prinzip aufgefunden werden, das von der Totalität der möglichen Formen Rechenschaft gibt, ein Prinzip basiert auf der Analyse der Entelechie'' (10, S. 287). DRIESCH sagt also selber, dass wir jetzt noch nicht so weit sind. Seiner Meinung nach ist die biologische Systematik zur Zeit noch nicht weiter gelangt als eine blosse katalogisierende Klassifikation. Es ist aber gerade diese Klassifikation, die eine typisch Aristotelische Begriffsbildung hat und die sich nur zögernd dem modernen Funktionsbegriff offenstellt. Ob sich in einem rationellen System die Entelechie in der von DRIESCH aufgefassten Form handhaben könne, lässt sich hier nicht angeben. Es scheint aber, dass mit der Einführung solcher rationellen Prinzipien eben der Charakter der Entelechie angegriffen wird. Und damit würde, unserer Meinung nach, vom vitalistischen Standpunkte DRIESCHS die Möglichkeit einer rationellen Systematik für die Biologie in Frage gestellt werden.

Wir möchten an dieser Stelle noch PLATES Erbstockhypothese anführen. PLATE formuliert sie in dieser Weise: „Man muss daher annehmen, dass das Keimplasma einer Art sich zusammensetzt aus einem

1) Man bedenke das Genetik = Physiologie = Kausalforschung ist.

2) PHILIPTSCHENKO unterscheidet: Variabilitat (Veränderlichkeit als Zustand = statisch) und Variation (Veränderlichkeit als Prozess = dynamisch).

nur schwer veränderlichen „Erbstock'' und den mendelnden Genen. Der Erbstock ruft alle wichtigsten Organe hervor, deren äussere Einzelheiten von Erbfaktoren nach den Mendelschen Gesetzen bestimmt werden'' (21, S. 99—100). PLATES Erbstockhypothese besagt im grossen ganzen nichts anders als ein Unterschied in der Vererbung der Organe und der ihrer Merkmale. Prinzipiell ist diese Unterscheidung nach der Auffassung PLATES selbst indessen nicht. Die Theorie ist aus phylogenetischen Ueberlegungen hervorgegangen und hat dann auch wichtigere Ansätze zur Phylogenie als zur Systematik. PLATE ist der Meinung, dass Organe bei ihrem ersten Auftreten in Bezug auf die Vererbung mit mendelnden Eigenschaften gleichzustellen sind. Allmählich wird der Erbgang komplizierter, indem immer mehr Gene an der Ausbildung des Organs teilnehmen. Endlich bildet sich ein mehr oder weniger fester Genenkomplex (Radikal), das sich dann aus den Chromosomen ausscheidet und sich dem Erbstock anschliesst. Zuletzt wird die Vererbung des Organs vom Erbstock verursacht, die Vererbung seiner Eigenschaften (Merkmale) von den in den Chromosomen gelagerten Genen. Hier macht PLATE (wie fast alle Lamarckisten) ein gewisser Gegensatz zwischen den „beginnenden'' und den phylogenetisch völlig ausgebildeten Organe. Beginnende Organe und Ausprägungen (Merkmale) der älteren Organe vererben sich nach mendelistischer Weise, d.h. es besteht die Möglichkeit, dass sie phänotypisch abwesend sind. Daraus ergibt sich, dass sie nicht in irgendeiner Weise für die wesentliche Bestimmung des Organismus wichtig sind. Diese kann daher nur vom Erbstock ausgehen. Die Systematik hat hier nichts mit der „nur schweren'' Veränderlichkeit des Erbstocks zu tun, sondern an erster Stelle mit den Verschiedenheiten in den Erbstöcken verschiedener Organismen. In gewissem Sinn kann ein Organ für die Systematik erst dann grössere Bedeutung bekommen, wenn sein Träger in den Erbstock aufgenommen ist, wenn er also eine gewisse Beharrlichkeit bekommen hat, d.h. wenn er sich dem Bauplan angeschlossen hat. Der etwas rätselhafte Erbstock kommt als Summe bestimmter Genkomplexe zustande. Ob dies nur eine Summe ist, oder ob etwa ein „Ganzheitsfaktor'' (Gestaltqualität) hinzutritt, lässt PLATE unerörtert. Im grossen ganzen ist die ganze Theorie noch nicht mehr als eine auf spekulativem Wege gewonnene phylogenetische Hypothese.

Wir wollen es bei diesen kritischen Bemerkungen bewenden lassen. Für unsere Betrachtungen ist wesentlich, dass ein Teil der Eigenschaften der genetischen Analyse zugänglich und ein anderer Teil ihr nicht

zugänglich ist. Letzterer ist freilich noch gar keiner Analyse zugänglich. Phylogenetische Erwägungen lassen wir hier dahingestellt sein. Die ganze Hypothese besagt nichts anderes als eine P a n genesis, in welcher aber nur ein Teil der Pangene durch Analyse bekannt gemacht werden kann. Der genetisch analysierbare Teil der Eigenschaften ist nur der, der für die Speziesunterscheidung am wenigsten wichtig ist. Mit anderen Worten: die Speziesunterscheidung kann nur durch die von dem „Erbstock'' hervorgerufenen Eigenschaften ausgeführt werden. Das hat Plate wahrscheinlich nicht in so scharfer Form aussagen wollen, aber wir werden zu dieser Formulierung durch die Tatsache geführt, dass die mendelnden Merkmale nur Varietätsmerkmale sind.

Obwohl der Erbstock logisch nicht ohne weiteres als Substanz zu bezeichnen ist, meinen wir, dass in der Aufstellung derartiger Theorien sich psychologisch das Bedürfnis nach einer substantiellen Form offenbart. Und von diesem Gesichtspunkt aus stehen die Theorien Plates und Vavilovs mit den noch zu erwähnenden F. W. Wents und Wolterecks auf einer Höhe. Zur Speziesbestimmung, bzw. phylogenetischen Untersuchungen muss man einerseits die Akzidenzien lösen; es bleibt aber dann noch Etwas, das als Substrat die Akzidenzien trägt, bzw. verwirklicht. Aber andererseits will man das „Wesentliche'' als das, was die Klassenzugehörigkeit bestimmt, kennen. Ist diese Substanz nun rein abstraktiv erhalten, wie bei Vavilov, oder aber mittels Ueberlegungen phylogenetischer oder physiologischer Art, wie bei Plate, bzw. Went, solange das von der Physiologie verheissene Konstruktionsschema nicht verwirklicht ist, sind nur solche substanziellen Formen zur Klassifikation anwendbar.

In ihrer Annahme, dass der „Erbstock'' prinzipiell nicht von dem „Mendelstock'' verschieden ist, steht nun die Theorie Plates denen anderer moderner Forscher gegenüber. Gemeinsam ist allen hier erwähnten Theorien, dass sie mendelnde und nicht-mendelnde Eigenschaften unterscheiden, von denen letztere eine gewisse Diskontinuität hervorrufen, durch die sie zur Speziesunterscheidung geeignet sind.

F. W. Went (37) hat neuerdings eine physiologische Theorie projiziert, die zwar in Einzelheiten nicht direkt einwandfrei erscheint, aber doch für unsere Betrachtungen wichtige Elemente enthält. Die Theorie ist eine Erweiterung eines von Correns (1901) geäusserten Satzes, dass die erblichen Faktore des Kernes durch Mithilfe des Protoplasmas zur Entfaltung kommen können. Went nimmt nun eine stoffliche Lokalisation der erblichen Eigenschaften in den Chromosomen an. Die Akti-

vierung dieser Eigenschaften vollzicht sich in einer bestimmten Reihenfolge. Er betrachtet sie als von „Nebenstoffen'' bewirkt, die nach einander mit einer „Grundsubstanz'' [1]), die er ins Protoplasma hineinlegt, reagieren. Durch diese Reaktionen ändert sich das Protoplasma immer und sollen die nacheinanderfolgenden Stadien einen verschiedenen formgebenden Wert haben. Die in den Chromosomen lokalisierten Nebenstoffe sollten etwa die mendelnden Eigenschaften hervorrufen, die „Grundsubstanz'' (an sich, oder durch die Einwirkung bestimmter entwicklungsanregender Nebenstoffe?) den Bauplan. Die Nebenstoffe haben an sich keine Bedeutung, nur in Verbindung mit der „Grundsubstanz'' wird ihre Wirkung manifestiert. Die Gene (Nebenstoffe) sind unserer Forschung zugänglich, die „Grundsubstanz'' bleibt aber dieselbe [2]) und entzieht sich der jetztigen genetischen Analyse. In dieser „Grundsubstanz'' sind also wichtige substanzielle Eigenschaften gegeben: einerseits die spezifische Eigentümlichkeit, die Beharrlichkeit, andererseits aber auch die Eigenschaften des Substrats, an dem die Akzidenzien verbunden sind.

WOLTERECK (39) endlich weist nochmals hin auf den Gegensatz zwischen den festen, beharrlichen, spezifischen Eigenschaften und die Eigenschaften akzessorischer Art. Wie alle anderen hier angeführten Forscher denkt er sich die letzteren in den Chromosomen lokalisiert. Für die spezifischen Eigenschaften nimmt er eine „Artsubstanz'' [3]) an, die seiner Meinung nach „kaum hypothetisch'' ist. „Die lebende, in allen Zellen eines Organismus spezifische Zell- und Kernsubstanz kann als Tatsache betrachtet werden. Aber sie ist eine komplexe Grösse und als solche für die Analyse untauglich'' (39, S. 298).

Alle diese Betrachtungen zeigen, dass die jetzige Forschung noch keine Antwort auf die Frage nach der Natur der Spezifität geben kann.

Als wichtig ergibt sich, dass die physikalische Auffassung der Organismen für die gegenwärtige Systematik noch nicht anwendbar ist. Bei der Analyse bleibt eben ein unzugänglicher Restbestand zurück, mit welchem man gerade die spezifischen Eigenschaften verknüpft denken

1) Das Wort „Grundsubstanz'' soll hier ganz in dem von WENT beabsichtigten Sinn, d.h. ohne irgendwelche Beziehung zum Aristotelischen Terminus genommen werden. Wir wagen es aber nicht, den Terminus WENTs etwa mit „Grund s t o f f'' zu übersetzen.

2) Sie ändert offenbar nur ihre Beschaffenheit (*quodditas*), nicht ihre wesentliche Eigenschaften (*quidditas*).

3) Unter Substanz wird hier „Stoff'', nämlich „Artplasma'' verstanden.

muss. Von einigen Forschern wird diesem Rest, als Sitz der „Essenz'', noch ausserdem die Eigenschaften des Substrats, als Träger der Akzidenzien, zuerkennt. Weder phylogenetische noch physiologische Methoden haben diesen Rest schon angreifen können. Die Pangenesis hat also wohl zu einer Kritik, nicht aber zur Ueberwindung des Substanzbegriffes geführt. Und dadurch ist eben eine physikalische Auffassung der Organismen nach dem Reihenprinzip zurzeit nicht möglich. Bemerkt man uns gegenüber, dass sie aber doch in Prinzip gegeben ist, so erwidern wir: sie ist zurzeit noch eben nicht e i n i g e r m a s s e n e x a k t formulierbar. Es ist gerade dieser Restbestand, der der Analyse in dem Wege steht. Fragt man, was gerade das ist, was die spezifische Beschaffenheit der Pflanzen trägt, so kann man nur antworten, dass es das „eigentümliche Sein'' (τὸ τί ἦν εἶναι [1]) = εἶδος [2])) ist. Das ist eine Antwort im Sinne der Aristotelischen Begriffsbildung. Der moderne Naturwissenschaftler kann aber bei einer derartigen Antwort nicht stehen bleiben! Seine Analyse hört erst bei den letzten Atomen und Energien auf. In wie weit, und ob, es nun in der — vielleicht sehr fernen — Zukunft möglich sein wird, diesen wahrscheinlich letzten Aristotelischen Begriff der Naturwissenschaft zu beseitigen, können wir nicht voraussagen.

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ARTIFICIAL KEY TO THE ORCHID GENERA OF THE NETHERLANDS INDIES, TOGETHER WITH THOSE OF NEW GUINEA, THE MALAY PENINSULA AND THE PHILIPPINES

by

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(Oegstgeest).

It is often a very difficult task for the many amateurs and cultivators of Orchids, and I may add hardly in a less degree to students of the flora of the Netherlands Indies, to classify properly the Orchids they come across. The reason for this lies not only in the fact that the generic characters in this large order are often not easily distinguished but also in the fact that nearly every genus counts a certain number of more or less anomalous species, so that the limits between the genera are not always easy to determine. Besides, many descriptions are, even in principal points, incomplete, either because the authors had no sufficiently good material at their disposal, or because they did not take the trouble to draw up good descriptions. For these reasons species are unavoidably often placed into a wrong genus, to which fact a great deal of the prevailing confusion is to be ascribed.

Although in the course of years many questions have been solved, it cannot be denied that new problems did arise. Only very accurate and complete descriptions, the best, of course, elucidated by figures after fresh or alcohol material, can put us in a position to decrease these difficulties.

In order to meet at least in some way the wishes of many, I have tried to make a key to the genera of *Orchidaceae* occurring in the Netherlands Indies. It is far from me to think, that I have solved with this the difficulties, alone already for the reason that I am not acquainted with some of these genera by my own study so that I have to rely in such cases upon often incomplete data, and even because the limitation of genera which I know from personal experience in some cases have not yet become quite clear to me.

It is hardly necessary to state that this key does not claim the least scientific value; it is intended only as an effort to open in some degree a way to those who want to arrange the Orchid species in the right genera. Although it is meant only for the genera of the Netherlands Indies I have included those of New Guinea, the Malay Peninsula and the Philippines.

1. Two or three fertile anthers; three fertile stigmata 2
   One fertile anther; two fertile stigmata, the third transformed into a rostellum 4
2. Lip saccate or shoe-shaped; staminode large, disklike; anthers globose .... **Paphiopedilum** PFITZ.
   Lip not saccate; staminode 0 or filiform; anthers elongate, not globose 3
3. Three fertile stamens .... **Neuwiedia** BL.
   Two fertile stamens .... **Apostasia** BL.
4. Saprophytes 5
   No saprophytes; leaves sometimes reduced to scales 19
5. Anther inserted with a broad base; pollinia with caudicles towards the base of the anther 6
   Pollinia without or with appendages towards the top of the anther 7
6. Lip entire, spurred; flowers pale ... **Platanthera** L. C. RICH.
   Lip 3-lobed, not spurred; flowers coloured **Silvorchis** J. J. S
7. Lip with 2 bubbles or 2 spurs at the base 8
   Lip without bubbles, without or with 1 spur 9
8. Lip with two bubbles at the base; flowers in a spike ...... **Cystorchis** BL.
   Lip with 2 spurs; flowers large, solitary ... **Corybas** SALISB.
9. Stems more or less climbing, rooting; inflorescence much ramified .... **Galeola** LOUR.
   Stems (not the rhizome) not climbing, not rooting 10
10. Pollinia 8; flower with green markings on the lip .... **Pachystoma** BL.
    Pollinia less than 8 11
11. Sepals and petals connate 12
    Sepals and petals free 13
12. Stigma below the top of the column **Didymoplexis** GRIFF.
    Stigma at the base of the column .... **Gastrodia** R. BR.

13. Flowers at the base with a toothed cup.... **Lecanorchis** Bl.
Flowers without a toothed cup at the base 14
14. Lip with a usually short spur 15
Lip without a spur 16
15. Inflorescence nodding at the top; flowers pale (a spurless form not rarely occurs) .... **Epipogum** Gmel.
Inflorescence not nodding, tinged with green; spur short; flowers coloured .. .. **Eulophia** R. Br.
16. Ovary abruptly contracted in the much thinner pedicel ... **Stereosandra** Bl.
Ovary not abruptly contracted in the pedicel 17
17. Lip with a distinct, bilobed hypochile ...... **Aphyllorchis** Bl.
Lip without such like hypochile 18
18. Peduncle, roots and fruits thick; pollinia without a stipes ... **Galeola** Lour.
Peduncle thin; pollinia on a thin stipes ...... **Tropidia** Bl.
19. Anther inserted with a broad base, immobile; pollinia with caudicles towards the base of the anther 20
Pollinia without or with appendages towards the top of the anther 25
20. Fertile stigmata flat or concave, confluent, at best separated by a furrow 21
Stigmata separated, not flat 23
21. Lip spurred .... **Platanthera** L. C. Rich.
Lip not spurred 22
22. Leafy plants, flowers green; lip entire ...... **Herminium** L.
Saprophyte; flowers coloured; lip threelobed .... **Silvorchis** J. J. S.
23. Small plant with one sessile leaf and a few-flowered inflorescence; lip not spurred .... **Disperis** Sw.
Larger plants, leaves more than one, lip spurred 24
24. Claw of the lip adnate to the borders of the column and of the stigmata .... **Peristylus** Bl.
Stigmata free, on two shorter or longer processes .... **Habenaria** Willd.
25. Leaves reduced to scales 26
Normal leaves present, though sometimes very small 30
26. Stem elongate, climbing, rooting, green; flowers large, in few-flowered racemes .... **Vanilla** Sw.

Stem short; inflorescence more-flowered 27

27. Inflorescence 70—80 cm high; pollinia on a bifid stipes ...... **Dipodium** R. BR.

Inflorescence much shorter; pollinia with a simple stipes ... 28

28. Lip inserted on the top of the column foot **Chiloschista** LNDL.

No column foot 29

29. Pollinia 4 .... **Taeniophyllum** BL.

Pollinia 2 .... **Microtatorchis** SCHLTR.

30. Plants with annual tubers (stem- or roottubers), rarely the tubers longer lived 31

Plants without tubers or with pseudobulbs 37

31. Lip with two conical spurs ....**Corybas** SALISB.

Lip without or with one spur 32

32. Inflorescence not terminal on the leafy stem, usually developing before the leaf; leaf more or less reniform ... **Nervilia** GAUD.

Inflorescence terminal on the leafy stem 33

33. Leaf terete .... **Microtis** R. BR.

Leaf flat 34

34. Lip nearly similar in form to the sepals and petals; column on both sides with a tuft of hairs ...... **Thelymitra** FORST.

Lip distinctly different from the sepals and petals; column without tufts of hairs 35

35. Lip inserted on the top of the column foot, entire, with an appendage at the base; flower large ...... **Pterostylis** R. BR.

No column foot; lip without an appendage at the base; flowers small; leaf linear 36

36. Lip with numerous clavate appendages; column without petaloid wings .... **Caladenia** R. BR.

Lip without clavate warts; column with two petaloid wings .... **Diuris** Sw.

37. Sprouts one-leaved; inflorescence an erect raceme; flowers non resupinate (thus lip turned upward); lip entire, with a small cavity at the base, in which the short column is hidden .... **Cryptostylis** R. BR.

Otherwise 38

38. Inflorescences exclusively terminal on the leafy stems or pseudobulbs 39

Inflorescences axillary or lateral, sometimes besides terminal 96

39. No pseudobulbs; stems elongate, climbing, rooting 40
Stems not climbing, whether or not ramified, without aerial roots (sometimes rhizome climbing) 41
40. Inflorescence a short, (apparently) lateral raceme; lip adnate to the column rather over a long distance ...... **Vanilla** Sw.
Flowers in terminal panicles; lip very shortly or indistinctly adnate to the column .... **Galeola** Bl.
41. Young leaf convolutive, the margins overlapping one another 42
Young leaf duplicative, with the margins not overlapping; to this series belong also the terete and laterally compressed leaves 80
42. Terrestrial orchids with fascicled, fleshy roots; leaves radical, narrow; flowers small, second or spirally arranged .... **Spiranthes** L. C. Rich.
Otherwise 43
43. No real sympodium, stems after flowering emitting one or a few side branches near the inflorescence between the leaves; pollinia sectile 44
Rhizome covered with scales or sheaths without a blade; pollinia not sectile 67
44. Stigmata 2, separate 45
Stigma 1 53
45. Lip inside with hairlike appendages (perhaps a monstrous form of **Goodyera**) .... **Eucosia** Bl.
Lip without hairlike appendages within 46
46. Sepals and petals connate .... **Cheirostylis** Bl.
Sepals and petals free 47
47. Spur of the lip projecting between the lateral sepals 48
Base of the lip concealed by the lateral sepals 49
48. Spur inside with 2 distinctly stipitate glands; margins of the lip not laciniate .... **Vrydagzynea** Bl.
Spur inside with 2 sessile glands; margins of the lip laciniate .... **Anoectochilus** Bl.
49. Claw of lip on both sides laciniate ...... **Odontochilus** Bl.
Claw of lip entire or wanting 50
50. Blade of lip long clawed; flowers pure white **Myrmechis** Bl.
Blade of lip without or with a short claw 51
51. Column recurved; lip in the anterior part tubular and papillose .... **Tubilabium** J. J. S.

Column not recurved; lip otherwise 52

52. Lip turned downward; stipes of the pollinia broad; laciniae of the rostellum large .... **Zeuxine** LNDL.
Lip turned upward, or more or less oblique; stipes of the pollinia narrow; laciniae of the rostellum small **Hetaeria** BL.

53. Lip and column twisted 54
Lip and column not twisted: lip sometimes turned upward 55

54. Lip blade slightly broadened; column with two longitudinal lamellae in front .... **Macodes** BL.
Blade of lip strongly broadened; column without lamellac in front .... **Haemaria** LNDL.

55. Lip turned upward .... **Papuaea** SCHLTR.
Lip turned downward 56

56. Lip without appendages at the base within 57
Lip with glands, warts, lamellae or hairlike appendages at the base within 60

57. Spur long, bilobed at the top 58
Spur short, wide, not bilobed 59

58. Lip with 2 longitudinal thickenings on the blade ....
Herpysma LNDL.
Lip without thickenings .... **Erythrodes** BL.

59. Column with 2 subulate teeth near the stigma ....
Dicerostylis BL.
Column without teeth near the stigma ... **Hylophila** LNDL.

60. The ventricose part of the lip inside covered all over with or provided at the base only with 2 tufts of hairlike appendages 61
Lip without hairlike appendages, but inside at the base with glands or warts 63

61. Ventricose part of lip inside allover covered with hairlike appendages .... **Goodyera** R. BR.
Lip inside at the base with 2 tufts of hairlike appendages ... 62

62. Lip at the base adnate to the column, with a short, dorsally compressed spur, 3-lobed, with the midlobe clawed ....
Orchipedum BREDA
Lip not spurred, very concave, constricted on both sides above the base; blade sessile .... **Platylepis** BL.

63. Lip inside with a transverse row of warts; big plants with a thick stem and linear leaves .... **Lepidogyne** BL.

Lip inside at the base with 2 glands or warts 64
64. Blade of lip with a long, pectinate or crenate claw .... **Pristiglottis** CRETZ. et J. J. S. (**Cystopus** BL.)
Blade of lip not clawed or claw entire 65
65. Spur of lip distinctly projecting between the lateral sepals **Eurycentrum** SCHLTR.
Spur short, entirely or nearly entirely concealed by the lateral sepals 66
66. Column with 2 longitudinal lamellae in front **Dossinia** MORR.
Column without lamellae .... **Kuhlhasseltia** J. J. S.
67. No pseudobulbs; stems more-leaved 68
Pseudobulbs 1—2-leaved 71
68. Stems short, remote on the rhizome, c. 4-leaved; pollinia 4 **Claderia** Hook. f.
Stems approximate 69
69. Lip entire; pollinia 2 .... **Tropidia** BL.
Lip 3-lobed; pollinia 8 70
70. Petals broader than the sepals, fruit elongate **Arundina** BL.
Petals not broader than the sepals; fruit globose .... **Dilochia** LINDL.
71. Lip adnate to the column .... **Gynoglottis** J. J. S.
Lip free 72
72. Lateral sepals connate at the base and forming a twolobed mentum, narrowly enclosing the 2-lobed sac of the lip ...... **Bracisepalum** J. J. S.
Mentum not bilobed, not narrowly enclosing the base of the lip 73
73. Column with one terminal and 2 lateral wings, which are distinctly separate, the latter sometimes very small, rarely wanting .... **Dendrochilum** BL.
Column often winged at the top, without lateral wings ... 74
74. Lip entire, strongly sigmoid .... **Sigmatochilus** ROLFE
Lip otherwise 75
75. Lip distinctly saccate at the base 76
Lip more or less concave at the base (saccate in a few species of *Coelogyne*) 78
76. Column not or slightly winged, or broadly winged along nearly the whole length 77
Column winged at the top only .... **Nabaluia** AMES.

77. Blade of lip nearly entire or if 3-lobed with a sessile midlobe .... **Pholidota** LNDL.
Blade of lip 3-lobed; midlobe broadly clawed .... **Coelogyne** LNDL. sect. **Chelonistele.**
78. Column not winged .... **Acoridium** NEES.
Column slightly to strongly winged 79
79. Column slender; petals not abruptly clawed; flowers often large .... **Coelogyne** LNDL.
Column short; petals abruptly clawed ...... **Basigyne** J. J. S.
80. Pollinia 4 or 6, on one bifid or on 2 stipites which are each more or less spathulate at the top, inserted at the base of the broadened portion 81
Otherwise 82
81. Pollinia 4 .... **Podochilus** BL.
Pollinia 6 .... **Appendicula** BL.
82. Pollinia 2 .... **Bromheadia** LNDL.
Pollinia 4 83
Pollinia 8 93
83. Pollinia without gland and stipes 84
Pollinia with a gland and/or stipes 88
84. Column foot present; plants very multiform **Dendrobium** Sw.
No column foot 85
85. Leaves laterally compressed 86
Leaves not laterally compressed, often apparently convolutive 87
86. Column very short; stems usually crowded **Oberonia** LNDL.
Column somewhat elongate; stems very or moderately remote .... **Hippeophyllum** SCHLTR.
87. Column very short; flowers not resupinate, thus lip turned upward .... **Microstylis** NUTT.
Column long or short; lip turned downward .... **Liparis** L. C. RICH.
88. Lip without a sac or spur 89
Lip with a sac or spur 91
89. Inflorescence long peduncled, panicled... **Polystachya** JUSS.
Inflorescence sessile, one- or few-flowered, fascicled 90
90. Lip concave, sessile, entire; no column foot .... **Aglossorhyncha** SCHLTR.
Lip clawed, 3-lobed; column foot present ... **Sarcostoma** BL.
91. The strongly broadened base of the lateral sepals adnate to

the long spur of the lip into a long spurlike mentum (thus nearly like in many *Dendrobiums*...... **Sepalosiphon** SCHLTR.
Base of the lateral sepals not adnate to the spur of the lip into a long mentum 92

92. Lip at the base shortly adnate to the column **Glomera** BL.
Lip apparently not adnate to the column ....
Ischnocentrum SCHLTR.

93. Sepals connate, only free at the tops ... **Mediocalcar** J. J. S.
Sepals not connate 94

94. Stems more or less elongate, more-leaved; flowers in headlike, paniculate or spikelike, few- or many-flowered inflorescences; lip more or less saccate at the base, the cavity separated from the other part by a transverse lamella or thickening .... **Agrostophyllum** BL.
Sprouts one-leaved at the top; lip without a cavity separated by a transverse lamella at the base 95

95. Lip adnate at the base to the column foot by a longitudinal keel; column not divided in two arms... **Epiblastus** SCHLTR.
Lip not adnate to the column foot; column with arms or lobes containing the stigmata .... **Ceratostylis** BL.

96. Leaves convolutive 97
Leaves duplicative 113

97. Leafy stems elongate, climbing, rooting .... **Vanilla** Sw.
Stems not climbing and rooting, the rhizome sometimes... 98

98. Pollinia 2, often furrowed or split 99
Pollinia 4 105
Pollinia 8 107

99. Pseudobulbs one-leaved; inflorescences on rudimentary leafless pseudobulbs ,alternating with the normal ones 100
Pseudobulbs or stems two- or more-leaved 101

100. Column with 2 alae or arms .... **Chrysoglossum** BL.
Column without appendages .... **Diglyphosa** BL.

101. Pseudobulbs few-leaved; inflorescence elongate 102
No pseudobulbs; stem usually elongate and more-leaved, rarely short and c. two-leaved; inflorescence short 103

102. Lip faintly 3-lobed; inflorescence nodding at the top.........
Geodorum JACKS.
Lip more or less 3-lobed; inflorescence not nodding...........
Eulophia R. BR.

103. Pollinia without appendages; column foot very short; lip with 2 longitudinal ridges, which are confluent in front ... **Pseuderia** SCHLTR.
Pollinia with stipes and gland; no column foot; lip with 2 longitudinal, free ridges 104
104. Lip not clawed, saccate or spurred at the base **Tropidia** BL.
Lip spathulate, blade crisp .... **Corymborchis** THOU.
105. Lip elastically adnate to the column; flowers usually yellow and red; terrestrial .... **Plocoglottis** BL.
Lip not adnate to the column; colour of the flowers usually otherwise; usually epiphytes 106
106. Column very short; flowers small ... **Pseudacoridium** AMES
Column long; flowers usually medium sized or large .... **Coelogyne** LNDL.
107. Sepals united in a ventricose tube; column foot very long, strongly bent, the upper portion free; flowers large .... **Acanthephippium** BL.
Sepals not forming a ventricose tube 108
108. Lip more or less adnate to the column (the spur leaving out of account) 109
Lip not adnate to the column 110
109. Column over the whole length adnate to the claw of the lip .... **Calanthe** R. BR.
Column adnate to the lip at the base only ...... **Phajus** LOUR.
110. Pseudobulbs one-leaved 111
Pseudobulbs 2- or more-leaved 112
111. Flowers not resupinate; lip turned upward .... **Nephelaphyllum** BL.
Lip turned downward .... **Tainia** BL.
112. Lip with a 2-lobed callus between the lateral lobes; terrestrial .... **Spathoglottis** BL.
Lip with longitudinal ridges; epiphytes .... **Eria** LNDL. sect. **Goniorhabdos**
113. Stems with unlimited top growth, often ramified; no rhizome 135
Stems with limited top growth, the basal portions forming a sympodium (rhizome) covered with scales or sheaths 114
114. Pollinia 4 or 6, on one bifid or on 2 stipites which are each more or less spathulate broadened at the top, inserted at the base of the broadened portion 115

Pollinia otherwise 116
115. Pollinia 4 .... **Podochilus** Bl.
Pollinia 6 .... **Appendicula** Bl.
116. Pollinia 2 117
Pollinia 4 124
Pollinia 8 127
117. Claw of the lip adnate to the inferior portion of the column or to a projecting appendage of it, forming a tubular cavity; with pseudobulbs 118
Lip not adnate to the column in such a way 119
118. Lateral sepals connate; pseudobulbs few-leaved .... **Acriopsis** Reinw.
Lateral sepals free; pseudobulbs one-leaved .... **Thecostele** Rchb. f.
119. Stems more or less climbing, rooting; no rhizome.............. **Dipodium** R. Br.
Stems not climbing and rooting; rhizome present 120
120. Inflorescence very short, dense, sometimes besides terminal **Bromheadia** Lndl.
Inflorescence more or less elongate, loose 121
121. Column with 2 arms; inflorescence very long and loosely ramified .... **Porphyroglottis** Ridl.
Column without arms; inflorescence simple 122
122. Lip with 3 ridges, pollinia each on a lobe of the short stipes .... **Grammatophyllum** Bl.
Lip with 2 ridges; stipes of the pollinia not lobed 123
123. Lip free from the column; stipes of the pollinia broad ...... **Cymbidium** Sw.
Lip with a very short claw adnate to the column; stipes narrow .... **Cyperorchis** Bl.
124. Inflorescences from the pseudobulbs or stems .... **Dendrobium** Sw.
Inflorescences from the rhizome or at the base of the pseudobulbs 125
125. Pollinia with caudiculae .... **Dendrochilum** Bl. sect. **Eudendrochilum**
Pollinia without appendages, rarely with a viscous mass. ... 126
126. Pollinia sometimes with a viscous mass (in section **Sestochilos**); lip polymorphous .... **Bulbophyllum** Thou.

Pollinia without a viscous mass; lip strongly saccate ...... **Pedilochilus** SCHLTR.

127. Inflorescence from the base of the pseudobulbs, paniculate **Ridleyella** SCHLTR.

Inflorescence simple 128

128. Concave base of lip separated from the anterior portion by transverse thickenings between the lateral lobes .... **Agrostophyllum** BL.

Lip without transverse thickenings 129

129. Sepals connate in a tube; pseudobulbs depressed globose ... **Porpax** LNDL.

Sepals sometimes connate at the base but not forming a tube; pseudobulbs otherwise 130

130. Pollinia on a common, thin stipes 131

Pollinia not on a common thin stipes 133

131. Floral parts parallel, at least at the base, flowers usually hardly opening; lip at the base with a longitudinal thickening, with a little, probably nectariferous groove on both sides; anther rather long, more or less acuminate ... **Thelasis** BL.

Floral parts not parallel; lip without a longitudinal thickening, but with 2 glands near the base; anther short and obtuse 132

132. Stems elongate; leaves laterally compressed; lip not clawed; no column foot .... **Octarrhena** THW.

Leaves usually not laterally compressed; if so stems very short; lip more or less distinctly clawed; column foot present, though usually very short .... **Phreatia** LNDL.

133. Stems elongate; leaves laterally compressed; column recurved, ventricose in front, with a cavity; no column foot .... **Chitonanthera** SCHLTR.

Leaves very rarely laterally compressed; column otherwise; column foot present 134

134. Leaves very rarely laterally compressed; pollinia firmly attached to the caudicles................................ **Eria** LNDL.

Leaves not laterally compressed; rachis filiform; anther 2-lobed at the top; pollinia very loosely inserted .... **Poaephyllum** RIDL.

135. Pollinia 8 136

Pollinia 2 or 4 139

136. Floral parts strongly connivent, only the tips sometimes recurved; anther rather long, acuminate ...... **Thelasis** BL.
Flowers usually well opened, anther short, blunt 137
137. Leaves usually not compressed, but if so stem very short; flowers usually white; lip more or less clawed; column foot present though usually very short .... **Phreatia** LNDL.
Stems elongate; leaves laterally compressed; lip not clawed; no columnfoot 138
138. Pollinia on a common stipes; column not recurved, not ventricose in front .... **Octarrhena** THW.
Pollinia not on a common stipes; column recurved, ventricose in front, with a cavity .... **Chitonanthera** SCHLTR.
139. Leaves with 3 nerves prominent beneath... **Dipodium** R. BR.
Nerves not or only the midrib prominent beneath 140
140. Pollinia 4 nearly equally large, free one from another 141
Pollinia 2, often furrowed or more or less deeply split, or 4 joined in 2 bodies, often unequal 143
141. Leafless; inflorescences more or less elongate, at least the peduncle .... **Taeniophyllum** BL.
Leafy plants; inflorescences very short 142
142. Leaves laterally compressed; inflorescences 2-flowered; flowers tender, white; lip spurred .... **Microsaccus** BL.
Leaves thick, often triangular in section, channelled above; inflorescence one- or more-flowered, flower fleshy; lip not spurred .... **Adenoncos** BL.
143. Sepals and petals more or less connate in a tube which is split up between the lateral sepals; lip spurred; pollinia 2; not rarely leafless .. .. **Microtatorchis** SCHLTR.
Sepals and petals free 144
144. Pollinia 4, equal or unequal, united in 2 bodies 145
Pollinia 2, often furrowed or more or less deeply split 164
145. Petals inserted on the column foot; leafless or sometimes with a few small leaves .... **Chiloschista** LNDL.
Petals not inserted on the column foot or no column foot; leafy plants 146
146. Column foot distinct though sometimes rather short 147
Column foot wanting or obsolete 151
147. Lip not spurred 148
Lip spurred 149

148. Anther at the base with a broad, reverse appendage, which covers the back of the column; pollinia unequal ....
Calymmanthera SCHLTR.
Anther without appendage; pollinia equal ....
Cordiglottis J. J. S.

149. Spur thin, not forming a continuation of the narrow column foot; pollinia unequal .... **Ornithochilus** WALL.
Spur wide saccate, the back-side forming the continuation of the broad column foot 150

150. Pollinia equal; lip inside without a callus ... **Bogoria** J. J. S.
Pollinia very unequal, the posterior ones the smallest; lip inside with a callus .... **Thrixspermum** LOUR.

151. Lip movable or elastically inserted .... **Arachnis** BL.
Lip immovable 152

152. Flowers not resupinate, thus lip turned upward, and with the tip of the spur directing upward or towards the top of the inflorescence 153
Flowers resupinate; lip turned downward 154

153. Lip 3-lobed; lobes small, closing together and with the spur distinctly shoe-shaped; spur with a longitudinal septum ...
Camarotis LNDL.
Lip not shoe-shaped; spur without a septum but with a transverse scale usually dentate at the apex from the back side .... **Pomatocalpa** BREDA

154. Rostellum very large, ovate triangular, connected with the column only with the middle of the broad base; spur conic, inside with a tranverse wall; flowers very small ....
Abdominea J. J. S.
Otherwise 155

155. Lip with appendages near the base of the back-side, that manifestly narrow the entrance of the spur 156
Lip not with such appendages 157

156. Lip at the base of the back-side with a projecting, horizontal, usually pubescent and more or less linear lamella, usually very complicate in shape and rather a long way adnate to the column .... **Trichoglottis** BL.
Lip at the back-side with a callus variable in shape...........
Sarcanthus LNDL.

157. Lip with a very wide sac, more or less basin-shaped .... **Gastrochilus** D. DON
Spur short or long, but not basin-shaped 158
158. Inflorescence one-flowered; small plant with relatively large flowers .... **Ceratochilus** BL.
Inflorescence more-flowered 159
159. Rostellum very long; anther with a long, sharply reflexed beak; small-flowered .... **Schoenorchis** BL.
Rostellum and anther otherwise 160
160. Flowers thick, fleshy, usually yellow or yellowish, often dotted red or brown; spur short or hardly saccate 161
Flowers thin; spur distinct 162
161. No spur; base of lip concave, rounded behind; in a few species a short spur directed backward .... **Vandopsis** PFITZ.
Lip at the base very short angular saccate... **Acampe** LINDL.
162. Pollinia very unequal; spur widened at the base; small plants .... **Saccolabiopsis** J. J. S.
Pollinia slightly unequal; spur not widened at the base; large plants 163
163. Midlobe and sidelobes of the lip nearly on the same level; principal colour of the flowers red, often mottled .... **Renanthera** LOUR.
Lateral lobes reaching much higher than the midlobe; flowers purple .... **Ascoglossum** SCHLTR.
164. No distinct spur, but the lip sometimes concave or somewhat saccate at the base 165
Lip with a distinct spur 172
165. Column foot distinct 166
Column foot wanting or very indistinct 170
166. Lip inserted immovably on the column foot .... **Phalaenopsis** BL.
Lip inserted movably or elastically 167
167. Lip strongly bent; leaves compressed laterally or terete ... **Cheirorchis** CARR
Lip not manifestly bent; leaves not laterally compressed or terete 168
168. Lip with a short, broad, fleshy claw ... **Chroniochilus** J. J. S.
Lip without claw 169
169. Column long, straight; column foot very short, lip with a

very small pit at the base .... **Sarcochilus** R. BR.
Column short; column foot not very short; lip without a cavity at the base .... **Chamaeanthus** SCHLTR.

170. Flowers very large, flat; habitus of *Vanda* **Euanthe** SCHLTR.
Flowers small, not flat 171

171. Leaves flat; inflorescences as long as the leaves .... **Dryadorchis** SCHLTR.
Leaves terete; inflorescences very short, dense, much shorter than the leaves .... **Luisia** GAUD.

172. Lip more or less movable, inserted on the top of the distinct column foot 173
Lip immovable 174

173. Inflorescence viscid; flowers rather fleshy, rather long lasting; spur usually conic and incurved, inside with appendages .... **Aerides** LOUR.
Flowers tender, ephemerous; spur without appendages within **Sarcohilus** R. BR.

174. Pollinia much shorter than the stipes 175
Pollinia not or hardly shorter than the stipes 181

175. Blade of lip large and broad, fleshy, sigmoid or nearly flat, entire or shortly 3-lobed at the top; spur pointing backward and laterally compressed; leaves usually with longitudinal pale stripes .... **Rhynchostylis** BL.
Lip 3-lobed; lobes sometimes very small; spur not or dorsally compressed; leaves without pale stripes 176

176. Side lobes of lip broad, thin, more or less fimbriate or erose at the apex; pollinia on a spathulate stipes .... **Pennilabium** J. J. S.
Side lobes not thin, not fimbriate or erose 177

177. Column long, arched; lip with 2 calli... **Renantherella** RIDL.
Column short, straight or recurved 178

178. Stipes of the pollinia broadened towards the base, with a large gland; leaf-sheaths warty and ciliate .... **Hymenorchis** SCHLTR.
Stipes of the pollinia not or broadened upward; leaf-sheaths not ciliate 179

179. Inflorescences erect; pedunculus muriculate; rachis thickened **Ascochilopsis** CARR
Inflorescence usually patent or directed downward; peduncle

not muriculate, glabrous or very rarely pubescent; rachis not thickened 180

180. Spur usually directed backwards or curved, inside at the base without appendages; midlobe thin and narrow (linear) ... **Malleola** J. J. S. et SCHLTR.

Spur usually incurved, the backside with longitudinal ribs or keels within .... **Robiquetia** GAUD.

181. Inflorescence short, paniculate, wholly red; flowers very small .... **Porphyrodesme** SCHLTR.

Inflorescence simple 182

182. Pollinia on a broad stipes 183

Pollinia on a narrow, linear stipes 184

183. Side lobes of the lip adnate to the column; midlobe acuminate **Pelatantheria** RIDL.

Lip not adnate to the column; midlobe not simply acuminate **Vanda** R. BR.

184. Lip at the base adnate to the column; spur bilobed at the top .... **Omoea** BL.

Lip not adnate to the column; spur not bilobed 185

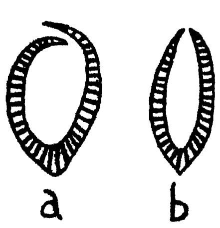
185. Midlobe of lip ligulate, sidelobes erect, pressed against the column .... **Ascocentrum** SCHLTR.

Midlobe fleshy, callus-shaped; sidelobes not pressed against the column .... **Saccolabium** BL.

Oakes Ames mentions the genus **Angraecum** BORY for the Philippine Islands. The shape of the column and pollinia are, however, not yet sufficiently known to incorporate it in this key

A few remarks, which may be of some interest to the users, may find a place here.

It has become obvious to me that the expressions "convolutive" and "duplicative", which refer to the leaf vernation, are yielding difficulties to many persons. Convolutive means that the margins of the young leaf, before it is unfolded, more or less are overlapping one another (a), duplicative that they close together (b). In both cases it may occur that, besides, the leaves are wrinkled. Duplicative, wrinkled leaves have sometimes the appearance of being convolutive (*Microstylis, Liparis*).



In the following lists I have enumerated the Orchid genera with convolutive and those with duplicative leaves.

Malayan Orchid genera with convolutive vernation.

(Names in brackets refer to saprophytic plants).

Acanthephippium Bl.
Acoridium Nees et Mey.
Anoectochilus Bl.
(Aphyllorchis Bl.)
Apostasia Bl.
Arundina Bl.
Basigyne J. J. S.
Bracisepalum J. J. S.
Caladenia R. Br.
Calanthe R. Br.
Cheirostylis Bl.
Chrysoglossum Bl.
Claderia Hook. f.
Coelogyne Lndl.
Corybas Salisb.
Corymborchis Thou.
Cryptostylis R. Br.
Cystorchis Bl.
Dendrochilum Bl. (excl. sect. Eudendrochilum)
Dicerostylis Bl.
(Didymoplexis Griff.)
Diglyphosa Bl.
Dilochia Lndl.
Disperis Sw.
Diuris Sw.
Dossinia Morr.
(Epipogum Gmel.)
Eria Lndl. sect. Goniorhabdos
Erythrodes Bl.
Eucosia Bl.
Eulophia R. Br.
Eurycentrum Schltr.
Galeola Lour.
(Gastrodia R. Br.)
Geodorum Jack
Goodyera R. Br.
Gynoglottis J. J. S.
Habenaria Wlld.
Haemaria Lndl.
Herminium L.
Herpysma Lndl.
Hetaeria Bl.
Hylophila Lndl.
Kuhlhasseltia J. J. S.
(Lecanorchis Bl.)
Lepidogyne Bl.
Macodes Lndl.
Microtis R. Br.
Myrmechis Bl.
Nabaluia Ames
Nephelaphyllum Bl.
Nervilia Gaud.
Neuwiedia Bl.
Odontochilus Bl.
Orchipedum Breda
(Pachystoma Bl.)
Papuaca Schltr.
Peristylus Bl.
Phajus Lour.
Pholidota Lndl.
Platanthera L. C. Rich.
Platylepis Lndl.
Plocoglottis Bl.
Pristiglottis Cretz. et J. J. S.
Pseudacoridium Ames
Pseuderia Schltr.
Pterostylis R. Br.

Sigmatochilus Rolfe
(Silvorchis J. J. S.)
Spathoglottis Bl.
Spiranthes L. C. Rich.
(Stereosandra Bl.)
Tainia Bl.
Thelymitra Forst.
Tropidia Lndl.
Tubilabium J. J. S.
Vanilla Sw.
Vrydagzynea Bl.
Zeuxine Lndl.

Malayan Orchid genera with duplicative vernation.

Abdominea J. J. S.
Acampe Lndl.
Acriopsis Reinw.
Adenoncos Bl.
Aerides Lour.
Aglossorhyncha Schltr.
Agrostophyllum Bl.
Angraecum Bory
Appendicula Bl.
Arachnis Bl.
Ascocentrum Schltr.
Ascochilopsis Carr
Ascoglossum Schltr.
Bogoria J. J. S.
Bromheadia Lndl.
Bulbophyllum Thou.
Calymmanthera Schltr.
Camarotis Lndl.
Ceratochilus Bl.
Ceratostylis Bl.
Chamaeanthus Schltr.
Cheirorchis Carr
Chiloschista Lndl.
Chitonanthera Schltr.
Chroniochilus J. J. S.
Cordiglottis J. J. S.
Cymbidium Sw.
Cyperorchis Bl.
Dendrobium Sw.
Dendrochilum Bl. sect. Eudendrochilum
Dipodium R. Br.
Dryadorchis Schltr.
Epiblastus Schltr.
Eria Lndl. (excl sect. Goniorhabdos)
Euanthe Schltr.
Gastrochilus D. Don
Glomera Bl.
Grammatophyllum Bl.
Hippeophyllum Schltr.
Hymenorchis Schltr.
Ischnocentrum Schltr.
Liparis L. C. Rich.
Luisia Gaud.
Malleola J. J. S. et Schltr.
Mediocalcar J. J. S.
Microsaccus Bl.
Microstylis Nutt.
Microtatorchis Schltr.
Oberonia Lndl.
Octarrhena Thw.
Omoea Bl.
Ornithochilus Wall.
Paphiopedilum Pfitz.
Pedilochilus Schltr.
Pelatantheria Ridl.
Pennilabium J. J. S.
Phalaenopsis Bl.
Phreatia Lndl.
Poaephyllum Ridl.
Podochilus Bl.

Polystachya Lndl.
Pomatocalpa Breda
Porpax Lndl.
Porphyrodesme Schltr.
Porphyroglottis Ridl.
Renanthera Lour.
Renantherella Ridl.
Rhynchostylis Bl.
Ridleyella Schltr.
Robiquetia Gaud.
Saccolabiopsis J. J. S.
Saccolabium Bl.
Sarcanthus Lndl.
Sarcochilus R. Br.
Sepalosiphon Schltr.
Taeniophyllum Bl.
Thecostele Rchb. f.
Thelasis Bl.
Thrixspermum Lour.
Trichoglottis Bl.
Vanda R. Br.
Vandopsis Pfitz.

Herpysma Lndl. This genus was based on a single species from the Himalaya Mountains, *H. longicaulis* Lndl. In 1907 OAKES AMES described a second species, *H. Merrillii* Ames, from the Philippines, but transferred it to *Erythrodes* Bl. in 1909 (Orch. III, 79, pl. 54), whereas SCHLECHTER maintained it under *Herpysma*. Shortly C. E. CARR (in Journ. Str. Br. R. As. Soc. XI [1933], 69, pl. 1, fig. B) added a third species to the genus, viz. *H. sumatrana* Carr. However, there is no doubt whatever, that this species is identical with *Erythrodes bracteata* Schltr. (*Physurus bracteatus* Bl.), a plant which appears not to be rare in Sumatra. Although the coalescence of the lip with the column is only very slight and not more than in *Erythrodes*, I think it advisable to place the species in *Herpysma* for the present. Thus it should bear the name **Herpysma bracteata** J. J. S. n. comb. (*H. sumatrana* Carr, *Physurus bracteatus* Bl., *Erythrodes bracteata* Schltr.). It is not impossible that the very blunt anther forms a good generic character, as it is very different from the, so far as I know, always acuminate anther of the species of *Erythrodes*.

Orchipedum Breda. This genus was first described and figured by BREDA in 1827 (Gen. et sp. Orch., fasc. II, t. 5). In 1858 BLUME (Fl. Jav. n. ser. I, 99, t. 27, fig. 1) changed the name in *Queteletia* Bl., on account of the older name *Orchipeda* Bl. (*Apocynaceae*); he redescribed the only species under the name *Q. plantaginifolia* Bl. and copied BREDA's plate. According to Dr J. TH. HENRARD, our Dutch expert for nomenclatural affairs, there is no reason why *Orchipedum* Breda should not stand.

After KUHL and VAN HASSELT the plant was not collected again and remained somewhat doubtful, until in 1929 it was redetected in Java

by Dr C. G. G. J. VAN STEENIS and Mr. R. C. BAKHUIZEN VAN DEN BRINK. Dried material and a photograph enabled me to state that the published figure and description are in general very good but that they are incorrect in a few details. In the first place the base of the lip is distinctly adnate to the column, and secondly the calli in the spur are no real calli but tufts of weak processes not unlike those which are found in the base of the lip of *Platylepis* Bl. and also which cover the inner surface of the ventricose part of the lip of *Goodyera* R. Br.

It became also clear that *Orchipedum* Breda covers entirely the genus *Philippinaea* Ames et Schltr. (in AMES Orch. VI, 1920, 278, pl. 100) from the Philippines, and that the only species should bear the name **Orchipedum Wenzelii** J. J. S. n. comb. (*Philippinaea Wenzelii* Ames et Schltr., *Adenostylis Wenzelii* Ames). According to the description and plate this species differs from the Javanese one in the much narrower leaves, the narrower anterior lobe of the lip and the appendages in the base of the lip being clavate.

The geographical distribution of the genus, at least so far as we know as yet, viz. one species in Java and one in the Philippines, is certainly remarkable.

Thelasis Bl. R. SCHLECHTER has (in Laut. Beitr. zur Fl. von Papuasien IX [1923], 148) based on his sections *Diplostypus* and *Rhynchophreatia* of *Phreatia*, which agree with my section *Hemithelasis* of *Thelasis*, his genus *Rhynchophreatia*. When proposing the section *Hemithelasis* I have expressed the opinion that this section in future perhaps should be raised to specific rank. In this way SCHLECHTER was thus with me.

Provisionally I think it correct to maintain the section under *Thelasis*, the floral structure not showing any difference with this genus, just as I have pointed out formerly. The divergence is to be found in the vegetative parts, in which the section is similar to my section *Rhizophyllum* or SCHLECHTER's *Eu-Phreatia* of *Phreatia*.

SCHLECHTER's description of the thickening of the lip is not wholly accurate. It is not "ein deutlicher, dicker, nach hinten gerichteter Kallus am Grunde des Labellums", but a thick longitudinal ridge, which is not free at the back end, but adnate to the base of the column and with a nectary on both sides, just like in other species of *Thelasis*.

Chiloschista Lndl. R. MANSFELD has (in Notizbl. Berlin XI, nr. 106 (1932), 491), chiefly following SCHLECHTER, united a few species of the

genus *Sarcochilus* R. Br., on which I based my section *Perspicilla,* with *Chiloschista* Lndl. I cannot follow him in this matter, as the principal differentiating character, the curious appendages of the anther, seems to me only of secondary value, which opinion is supported by the fact, that in one of the species these appendages are wholly lacking. In excluding the species which SCHLECHTER and MANSFELD added to it, *Chiloschista* is a sharply limited genus, whereas the limits grow unstable in adding to it a few species with a quite other flower-structure.

Rhynchostylis Bl. SCHLECHTER has (Orch. 1915, 587) founded his genus *Anota* on a few species which had been placed variously in *Saccolabium, Vanda* and *Rhynchostylis.* I have always had the idea that there was something unnatural in admitting a genus *Anota* next to *Rhynchostylis,* but for want of good material I could not judge of it definitely. Now I am much obliged to Mr. ED. QUISUMBING, Manila, for kindly forwarding to me flowers in formaline of *Rhynchostylis retusa* Bl. and *Anota violacea* Schltr. I have failed to find any differences of generic value which would justify the maintenance of a genus *Anota.* In *Rhynchostylis retusa* Bl. there is a rather distinct but short column-foot on which the lateral sepals are decurring, but in *Anota violacea* Schltr. it is not wanting, though shorter, as is clearly shown in the magnificent and accurate plate published recently by ED. QUISUMBING (in Phil. Journ. Sc., vol. 52 (1933), 271, pl. 1—3). The insertion of the lip, the column and pollinia do not show any essential characters, so that the Philippine species should bear the name **Rhynchostylis violacea** Rchb. f.

There appear to exist some differences between the specimens of *Rhynchostylis retusa* in Java and in the Philippines. QUISUMBING describes the flowers as odourless, whereas in Java they are strongly fragrant, and he describes the petals as oblong-ovate and rounded, whereas they show in the Java specimens exactly the same form as in QUISUMBING's figure of *Anota violacea.*

REVISION DER VON OZEANIEN, AUSTRALIEN UND NEUSEELAND ANGEFÜHRTEN LEJEUNEACEAE HOLOSTIPAE

(de Frullaniaceis XIV)

von

FR. VERDOORN

(Leiden)

In dieser Arbeit habe ich versucht, eine möglichst vollständige Revision aller von Ozeanien, Australien und Neuseeland angeführten Holostipae zu geben. Mit nur sehr wenigen Ausnahmen konnte ich fast alle Originale untersuchen. Ich habe auch den grössten Teil der Belege für die anderen Literaturangaben rediviert. Im folgenden werden nur Fundorte genannt, von denen ich Material untersuchen konnte.

Die vorliegende Arbeit schliesst sich eng an meine Bearbeitung der Holostipae in „Nova Guinea'' XVIII: 1—8 (1934) an. Früher, 1930, de Frullan. VIII (Nederl. Kruidk. Arch. 1930, p. 155—175), habe ich eine Revision der ozeanischen Frullanien gegeben. Damals wies ich schon auf die relativ kleine Anzahl der endemischen Arten Ozeaniens hin. Für die Holostipae kann man dasselbe feststellen. Die meisten ozeanischen Frullanien und Lejeuneen sind mit indomalayischen oder pantropischen Arten identisch oder nahe verwandt. Mehrere der in Ozeanien verbreiteten Jubuleen erreichen wohl die Marianen, Samoa, Tahiti, etc., fehlen aber auf Hawaii. Die meisten Inselgruppen besitzen einige endemische Arten, welche meistens deutliche Beziehungen zu indomalayischen Arten zeigen. Die auffallendsten und isoliertesten Endeme finden wir auf Neu-Kaledonien. Deutliche Beziehungen zwischen den Jubuleen von Australien und Neu-Kaledonien sind nicht festzustellen. Ausser typisch indomalayischen Sippen begegnen wir in Ozeanien einigen, wenn auch nicht vielen, rein neotropischen Gattungen, welche teilweise nur bis Hawaii, teilweise aber bis Australien, Neu-Seeland und bis Neu-Guinea vordringen.

Die Frullaniaceenflora von Australien und Neu-Seeland ist durch eine sehr grosse Anzahl endemischer Arten charakterisiert. Diese weisen zum grössten Teil weder Beziehungen zu den indomalayischen (und

ozeanischen), noch zu den neotropischen (wohl aber zu antarktischen) Arten auf. Die Holostipae von Australien und Neu-Seeland zeigen auch, wenn man nicht nur von Funden in Queensland ausgeht, etwas mehr Verwandschaft zu indomalayischen (und ozeanischen) Arten als die Frullanien. Doch stehen auch hier die meisten ziemlich isoliert. Nach der Untersuchung der Frullanien und Holostipae von Neu-Guinea lässt sich Folgendes sagen. Auf Neu-Guinea finden wir hauptsächlich indomalayische Jubuleen; dabei entstanden nur selten endemische Kleinarten. Dann kommen merkwürdige endemische Sippen (keine endemische Gattungen, sondern verwandtschaftlich völlig isolierte polymorphe Sektionen) vor. Schliesslich finden wir einige wenige neotropische Elemente (die sich alle auch in Ozeanien oder Australien finden) und ganz wenige, sonst auf Australien (oder Australien und das südl. extratrop. Amerika) beschränkte Elemente.

Für die Ueberlassung von grösseren rezenten Kollektionen schulde ich den Herren Prof. Dr W. A. Setchell in Berkeley, Cal. (Reise mit Parks nach Tahiti, im J. 1922), dem Bernice P. Bishop Museum in Honolulu (verschiedene Hawaii-Kollektionen), Mr. K. W. Allison in Rotorua (Neu-Seeland Kollektionen) und Mrs. E. A. Hodgson in Turiroa (idem) herzlichen Dank.

Weiter bin ich den Herbarien und Museen in Berlin (Dr H. Reimers); Genf, Herb. Boissier (Prof. R. Chodat und Dr G. Beauverd); Kew; Leiden; Paris (Dr P. Allorge); New York (Dr M. A. Howe); Strassbourg; Wien, Naturhist. Museum (Dr K. Keissler), sowie den Herren Prof. Dr Al. W. Evans (New Haven, Conn.), Prof. Dr Th. Herzog (Jena), Mr. W. E. Nicholson (Lewes) und Prof. Dr V. Schiffner (Wien) für die Hilfe beim Aufsuchen vieler Originale zu grossem Dank verpflichtet.

Acrolejeunea cucullata Steph. 1890 nom. nud., Hedwigia 29 : 10; 1907, Denkschr. Ak. Wiss. Wien 81 : 295 = *Ptychocoleus pycnocladus* (Tayl.) Steph.

Acrolejeunea fertilis (Rw. Bl. N.) Spr. 1884, Hep. Am. et And. p. 116; Steph. 1907, Denkschr. Ak. Wiss. Wien 81 : 295 = *Ptychocoleus fertilis* (Rw. Bl. N.) Trev.

Acrolejeunea marquesana Steph. 1995, Hedwigia 34 : 58 = *Ptychocoleus Cumingianus* (Mt.) Trev.

Acrolejeunea Novae Guineae Steph. 1889, Hedwigia 28 : 165, 1907. Denkschr. Ak. Wiss. Wien 81 : 295 = *Ptychocoleus Novae Guineae* (Steph.) Steph.

Acrolejeunea Rechingeri Steph. 1910, Denkschr. Ak. Wiss. Wien 85:195 = *Ptychocoleus Rechingeri* (Steph.) Steph. = *Ptychocoleus Hasskarlianus* (Gottsche) Steph.

Acrolejeunea securifolia Steph. 1890, Hedwigia 29 : 133 = *Ptychocoleus securifolius* (Endl.) Steph.

Acrolejeunea subinnovans Steph. 1895, Hedwigia 34 : 59 = *Ptychocoleus pycnocladus* (Tayl.) Steph.

Acrolejeunea Wildii Steph. 1889, Hedwigia 28 : 165 = *Ptychocoleus Wildii* Steph.

1. **Archilejeunea australis** St. 1911, Sp. Hepat. IV : 734. Unterscheidet sich von der verwandten *A. caramuensis* durch flächere Blätter (besonders der antikale Lobusrand ist weniger eingerollt) und vor allem durch die um 20 % kleineren, regelmässig verdickten Zellen, welche auch in der Lobusmitte mehr isodiametrisch sind, als dies bei *A. samoana* der Fall ist. Amphigastrien gross, rund, an der Insertion etwas breiter als bei *A. caramuensis*. Weiter hat *A. samoana* einen autözischen Blütenstand, während *A. australis* anscheinend monoezisch ist; ich konnte kein einziges Andrözium zwischen den zahlreichen weiblichen Pflanzen auffinden. Nach dem heutigen Stande unseres Wissens kommt *A. samoana* in Australien nicht vor. Australien (New S. Wales).

Archilejeunea bilabiata (Mitt.) Steph. 1911, Spec. Hepat. IV : 723 cf. sub *Phragmicoma*.

2. **Archilejeunea brachyantha** Jack et Steph. 1894, Bot. Centralbl. 60:105; Steph. 1911, Spec. Hep. IV:723, Verd. 1933, de Frull. XII:81. Von *A. caramuensis* leicht zu unterscheiden durch den stark eingebogenen (nicht eingerollten) antikalen Lobusrand, durch viel grössere flache Lobuli und kleinere Amphigastrien. Der Lobulus ist zwar nach demselben Prinzip aufgebaut wie der Lobulus von *A. caramuensis* (2 laterad gerichtete Zähne etc.), aber immer (an allen Pflanzen und an allen Blättern) gut entwickelt und im Verhältnis zu den Lobuli, doppelt so gross wie bei *A. caramuensis*. STEPHANI nennt in seinen Spec. Hep. l. c. die Art für Malacca, sie wurde dort jedoch niemals gefunden. Es handelt sich um eine Verwechselung mit *P. pycnocladus*. Fidschi Inseln.

Archilejeunea Brotheri Steph. 1911, Spec. Hepat. IV : 723 = *Ptychocoleus pycnocladus* (Tayl.) Steph.

Archilejeunea calcarata (Mitt.) Steph. 1911, Spec. Hepat. IV : 724 = *Mastigolejeunea calcarata* (Mitt.) Verd.

Archilejeunea caledonica Steph. 1911, Spec. Hepat. IV : 724 = *Thysananthus polymorphus* Sde Lac.

Archilejeunea caramuensis Steph. 1895, Hedwigia 34:59; 1911 Spec. Hepat. IV: 725 = *Archilej. samoana* Steph.

3. **Archilejeunea Etesseana** (Steph.) comb. nov. Steht *A. olivacea* ziemlich nahe, ist aber doppelt bis dreimal so gross, weiterhin sind die Amphigastrien viel breiter und die grossen Lobuli laufen in zwei grosse ziemlich breite Spitzen aus. Die ♀ Infl. habe ich nicht gesehen, nach der Zeichnung *Stephani*'s dürften die breiten Lobuli des Inv. charakteristisch sein. Neu-Kaledonien.

Archilejeunea falcata Steph. 1895, Hedwigia 34:60; 1911, Spec. Hepat. IV: 60 = *Archilejeunea mariana* (Gottsche) Steph.

4. **Archilejeunea falcifolia** St. 1910, Denkschr. Ak. Wiss. Wien 85: 196; 1911, Spec. Hepat. IV: 726. Vielleicht durch die grob und weit gezähnten Involucralblätter von *A. mariana* zu trennen. Andere Unterscheidungsmerkmale sind nicht anzugeben. Beide Arten sind monoezisch und stimmen in der Gestalt und besonders auch in der charakteristischen Faltung der Blätter und Amphigastrien völlig überein. Bei *A. mariana* beobachtet man manchmal gezähnte Amphigastrien, aber deutlich gezähnte Involucralblätter sah ich nie. Bougainville.

Archilejeunea Graeffei J. et St. 1894, Botan. Zentralbl. 60, 4; Steph. 1911, Spec. Hepat. IV: 727 = *Pycnolejeunea* sp. Hierher gehört auch *A. Michlitzii* St.

5. **Archilejeunea incrassata** Steph. 1908, Rev. Bryol. 35: 30; 1911, Spec. Hepat. IV: 728. Durch ihre geringe Grösse, Zellnetz etc. vorzüglich unterschiedene Art, autözisch. Neu-Kaledonien.

Archilejeunea Kaernbachii Steph. 1910, Denkschr. Ak. Wiss. Wien 85: 195 gehört zu den Schizostipae. Cf. de Frullan. XV.

6. **Archilejeunea mariana** (Gottsche) Steph. 1911, Spec. Hepat. IV: 729. Cf. de Frull. XV. Formosa, Vorderindien, Siam, Annam, P. Penang, Sumatra, Java, Borneo, Philippinen, Celebes, Neu Guinea, Mioko, Marianen, Yap, Neu Kaledonien, Salomon Inseln, Samoa, Cook Inseln, Tahiti, Hawaii.

Archilejeunea Micholitzii Steph. 1911, Spec. Hepat. IV : 729 = *Archilejeunea Graeffei* Jack et Steph. = *Pycnolejeuna* spec.

Archilejeunea Novae Caledoniae Steph. 1911, Spec. Hepat. IV : 729 = **Pycnoleunea** spec. In den Icones Ined. sind die Amphig. als „holostipa'' abgebildet, sie sind aber deutlich „schizostipa''. Eine Verwechs-

lung ist ausgeschlossen, da alle andere Angaben in den Spec. Hepatic. und die weiteren Abb. völlig mit dem Originalmaterial übereinstimmen. Ob es sich um eine schon beschriebene oder neue *Pycnolejeunea* handelt, kann ich nicht beurteilen.

7. **Archilejeunea olivacea** (Hook. f. et Tayl.) Steph. 1911, Spec. Hepat. IV: 734. Leicht von *A. caramuensis* und Verwandten zu unterscheiden. *A. brachyantha* von den Fidschi-Inseln steht näher, ist aber in allen Dimensionen viel kleiner, hat fast runde schmälere Amphigastrien und viel kleinere Zähne an den Lobuli. Die ♀ Involucra der beiden Arten dürften sich auch nicht völlig gleichen, ich kann das aber an dem spärlichen Material nicht mit Sicherheit feststellen. Belege für MITTEN's Angabe: Samoa und Raiatea sah ich nicht. Wahrscheinlich sind sie, besonders die erste, unrichtig. Neu-Seeland, Chatham Inseln.

Archilejeunea owahuensis (Gottsche ms.) Steph. 1911, Spec. Hepat. IV: 730 = *Archilejeunea mariana*. Wie ich in de Frull. XII: 81 schon mitteilte, hat STEPHANI auch manchmal *Brachiolejeunea sandvicensis* mit dem Namen *A. owahuensis* belegt. In den Kollektionen von FAURIE ist *Thysananthus polymorphus* als *A. owahuensis* det. STEPHANI herausgegeben.

8. **Archilejeunea robusta** (Steph.) Verd. comb. nov. Verwandt mit *A. olivacea* und *A. scutellata*, aber sehr viel grösser. Lobuli meistens mit zwei Spitzen, Lobi zugespitzt, ♀ Involucralbl. ganzrandig. Perianthium mit 2 deutlichen ventralen Falten. Australien (N. S. Wales).

Archilejeunea samoana (Mitt.) Steph. 1911, Spec. Hepat. IV: 731. Diese Pflanze ist mit der verbreiteten *A. Mariana* (= *A. caramuensis*) völlig identisch. In den Ic. Ined. ist auch noch eine „*Archilejeunea samoana* St. n. sp." abgebildet (ausser MITTEN's Original, von dem ebenfalls eine Zeichnung vorliegt), diese Pflanze gehört aber zu *Ptychocoleus* (Samoa, leg. Schauinsland, herb. Brotherus).

9. **Archilejeunea scutellata** (Hook. f. et Tayl.) Steph. 1911, Spec. Hepat. IV: 735. Einer robusten *A. mariana* nicht unähnlich, aber durch grössere zugespitzte, distad gerichtete Lobi, kleinere eingerollte Lobuli, grosse längliche Perianthien, etc. deutlich zu unterscheiden. Neu-Seeland, Ost-Australien.

Archilejeunea tahitensis Steph. 1911, Spec. Hepat. IV : 732 = *Mastigolejeunea humilis* (Gottsche) Spr.

Archilejeunea vanicorensis Steph. 1911, Spec. Hepat. IV: 733 = *Mastigolejeunea vanicorensis* (Steph.) Verd. comb. nov.

10. **Archilejeunea Wattsiana** (Steph. 1924 Spec. Hepat. VI : 559.

Steht *A. olivacea* sehr nahe, hat aber ein gezähntes ♀ Involucrum; manchmal sind auch die f. subinv. gezähnt. Die Zähne der Lobuli sind anders gestaltet als bei *A. olivacea.* Ob alle diese Merkmale zu einer spezifischen Trennung berechtigen, ist mit Sicherkeit erst nach dem Studium eines grösseren Materials zu entscheiden. Australien (Lord Howe Island).

Brachiolejeunea aliena Steph. 1897, Bull. Herb. Boiss. V : 842 = *Thysananthus polymorphus* Sde Lac.

Brachiolejeunea apiculata Steph. 1897, Bull. Herb. Boiss. V : 846 = *Thysananthus polymorphus* Sde Lac.

Brachiolejeunea Eavesiana (Gottsche) Steph. 1912, Spec. Hepat. V : 140 = *Archilejeunea scutellata* (Hk. f. et Tayl.) Steph.

Brachiolejeunea erectiloba Steph. 1912, Spec. Hepat. V : 138 ist entweder eine robuste Form von *Ptychocoleus pycnocladus* oder eine nahe verwandte endemische Art. Ohne reichlichere Aufsammlungen kann ich darüber nicht entscheiden.

Brachiolejeunea Etesseana Steph. 1912, Spec. Hepat. V : 133 = *Archilejeunea Etesseana* (Steph.) Verd. comb. nov.

Brachiolejeunea flavovirens Steph. 1910, Denkschr. Ak. Wiss. Wien 85 : 200, 1912 Spec. Hepat. V : 131 = *Thysananthus planus* Sde Lac.

Brachiolejeunea Frauenfeldii (Reich.) Steph. 1912, Spec. Hepat. V : 131 = *Mastigolejeunea Frauenfeldii* (Reich.) Steph.

Brachiolejeunea gibbosa (Aongstr.) Steph. 1912, Spec. Hepat. V : 132 = *Mastigolejeunea Frauenfeldii* (Reich.) Steph.

Brachiolejeunea Heussleri Steph. 1912 Spec. Hepat. V : 140 = *Archilejeunea olivacea* (Hk. f. et Tayl.) Steph. Leider konnte ich nur steriles Material untersuchen, dies ist üppig entwickelt, stammt wahrscheinlich von einem feuchten Standort, infolgedessen sind die Lobuli an ihren Rändern nur wenig differenziert. Man findet meistens 1 oder 2 nur ganz kleine Spitzchen, hier und da sind sie aber grösser und stimmen dann, wie übrigens alle anderen Teile der Pflanze, mit *A. olivacea* völlig überein.

Brachiolejeunea japonica Steph. 1897, Bull. Herb. Boissier V : 842 = *Brachiolejeunea sandvicensis* (Gottsche) Evs. In FAURIE's Kollektionen sind Hawaii-Pfl. unter dem obenstehenden Namen herausgegeben.

Brachiolejeunea Kirkii Steph. 1912, Spec. Hepat. V : 141 = *Archilejeunea scutellata* (Hk. f. et Tayl.) St.

Brachiolejeunea miokensis Steph. 1912, Spec. Hepat. V : 132 = *Mastigolejeunea humilis* (Gottsche) Spr.

Brachiolejeunea plagiochiloides Steph. 1889, Hedwigia 28 : 167; 1912, Spec. Hepat. V: 141. Das Original stammt vom „Schoolhaven" und wurde dort von BAEUERLEN gesammelt, leider konnte ich es nicht untersuchen. Material von W. W. WATT, das STEPHANI als *B. plagiochiloides* bestimmte, gehört teilweise zu *Archilej scutellata,* teilweise zu *Mastigolejeunea.* Der Zeichnung nach ist das Originalmaterial wahrscheinlich auch zu *A. scutellata* zu stellen. Um eine echte *Brachiolejeunea* handelt es sich jedenfalls nicht.

Brachiolejeunea robusta Steph. 1912, Spec. Hepat. V : 141 = *Archilejeunea robusta* (Steph.) Verd. comb. nov.

11. **Brachiolejeunea sandvicensis** (Gottsche) Evs. 1900, Transact. Conn. Acad. X: 419. Japan, Formosa, China, Tonkin, Annam, Vorderindien, Tahiti, Hawaii.

Brachiolejeunea sexplicata Steph. 1912, Spec. Hepat. V: 136 = *Brachiolejeunea sandivicensis* (Gottsche) Evs.

Brachiolejeunea Thozetiana (Gottsche et Müll.) Steph. 1912, Spec. Hepat. V: 142. Das Originalmaterial war nicht aufzufinden.

Brachiolejeunea Wattsiana Steph. in sched. = *Mastigolejeunea phaea* (Gottsche msc.) Steph.

Bryopteris filicina Nees. REICHARDT 1870, Reise der Novara p. 156 gibt diese Art an für Tahiti und bemerkt dazu: „diese Art ist somit auch auf den Inseln des stillen Ozeans verbreitet". Die betreffende Angabe bezieht sich aber auf *Thysananthus fruticosus.*

Bryopteris striata (Lehm. et Lindenb.) Mitt. 1871, Fl. vit. p. 411 = *Ptychanthus striatus* (L. et L.) Nees.

Bryopteris Sinclairii Mitt. 1862, Bonplandia 10: 19; 1871, Fl. vitiensis p. 411 = *Thysananthus fruticosus.* (Lindenb. et G.) Schiffn.

12. **Caudalejeunea circinata** Steph. 1912, Spec. Hepat. V: 13. Cf. de Frull. XV. Java, Borneo, Ceram, Neu-Kaledonien.

Caudalejeunea longistipula Steph. 1912, Spec. Hepat. V : 14 = *Thysananthus fruticosus* (Lindenb. et G.) Schiffn.

Caudalejeunea miokensis Steph. 1912, Spec. Hepat. V: 15 = *Caudalejeunea reniloba* (Gottsche) Steph.

Caudalejeunea recurvistipula (Gottsche) Steph. = *Caudalej. reniloba* (Gottsche) Steph.

13. **Caudalejeunea reniloba** (Gottsche) Steph. 1912, Spec. Hepat. V: 16. Cf. de Frull. XV. Siam, Andamanen, Java, Sumatra, Malayischer Halbinsel, Philippinen, Borneo, Celebes, Ceram, Neu-Guinea, Mioko, Marianen,

Queensland, Neu-Kaledonien, Ferguson Inseln, Admiralty Inseln, Samoa, Tahiti.

14. **Caudalejeunea samoana** Steph. 1907, Denkschr. Ak. Wiss. Wien 81:296; 1912, Spec. Hepat. V:16. Erinnert einigermassen an *C. Stephanii* Spr., ist aber durch Grösse und die eigentümlichen fransig gezähnten Lobuli und Involucralblätter sofort zu erkennen. Samoa.

Caudalejeunea Stephanii (Spr. msc.) Steph. 1912, Spec. Hepat. V:17. Die Angabe von STEPHANI 1907 (Denkschr. Ak. Wiss. Wien 81:296) kann kaum richtig sein, da *C. Stephanii* auf die Indomalaya beschränkt ist. Cf. auch sub *Thysan. planus* Sde Lac.

Dicranolejeunea Didericiana Steph. 1896, Hedwigia 35 : 77 = *Thysananthus polymorphus* Sde Lac.

Dendrolejeunea vittata (Mitt.) Steph. 1885, Hedwigia 24:90 = *Thysananthus fruticosus* (Lindenb. et G.) Schffn.

Harpalejeunea ? cuneistipula Steph. 1913, Spec. Hepat. V :267. Cf. sub *Phragmicoma cuneistipula* Mitt.

Jungermania olivacea Hook. f. et Tayl. 1844, Lond. Journ. Bot. III:568 = *Archilejeunea olivacea* (Hk. f. et Tayl.) Steph.

Jungermania securifolia Endl. 1833, Prodr. Fl. Norf. p. 5 = *Ptychocoleus securifolius* (Endl.) Steph.

Lejeunea aliena (nec **alcina**; sphalm!) Aongstr. 1872, Oefv. Kgl. Vet. Akad. Förh. 1872, 4, pag. 23 = *Thysananthus polymorphus* Sde Lac.

Lejeunea anguiformis (Hk. f. et Tayl.) Mitt. 1855, Fl. Nov. Zel. p. 157 = *Thysananthus anguiformis* (Hk. f. et Tayl.).

Lejeunea apiculata Steph. 1898, in Besch. J. de Bot. XII, Sep. p. 6 = *Brachiolejeunea apiculata* Steph. = *Thysan. polymorphus* Sde Lac.

Lejeunea auriculata (Wils. et Hook.) Sull. 1856, Gray, Manual, Ed. II, p. 699; Steph. 1898, in Besch., J. de Bot. XII, Sep. p. 6. Cf. sub *Mastigolejeunea.*

Lejeunea cryptocarpa Mitt. 1871, Fl. vitiensis p. 413 = *Symbyezidium cryptocarpum* (Mitt.) Steph.

Lejeunea Cumingiana (Mont.) Mitt. 1861, Hep. Ind. Orient. p. 110; Steph. 1898, in Bescherelle, J. de Bot., Sep. p. 4 = *Ptychocoleus Cumingianus* (Mt.) Trev.

Lejeunea elongata Aust. 1874, Bull. Torrey Bot. Cl. V : 17 = *Thysananthus polymorphus* Sde Lac.

Lejeunea eulopha Tayl. 1846, L. Journ. Bot. V :391; Steph. 1898 in Besch. Journ. de Bot. XII, Sep. p. 6 = *Lopholejeunea eulopha* (Tayl.) Spr.

Lejeunea filicina (Sw.) Steph. 1898, in Besch. J. de Bot. XII, Sep. p. 4. Cf. sub *Bryopteris.*

Lejeunea fimbriata Gottsche 1880, in Müll., Phragm. Phytog. Austr. XI:64 = *Lopholej. eulopha* (Tayl.) Spr.

Lejeunea Frauenfeldii (Reich.) Steph. 1898, in Besch. J. de Bot. XII, Sep. p. 4 und p. 7. (sic!) = *Mastigolejeunea Frauenfeldii* (Reich.) Steph.

Lejeuna gibbosa Aongstr. 1872, Oefv. Kgl. Vet. Ak. Förh. 1872, 4, pag. 23 (nec 1873, pag. 133) = *Lopholejeunea subnuda* (Mitt.) Steph.

Lejeunea guahamensis Lindenb. 1845, Syn. Hepat., p. 333 = *Mastigolejeunea humilis* (Gottsche) Spr.

Lejeunea Hasskarliana (Gottsche) Steph. 1898, in Besch., J. de Botan. XII, Sep. p. 4 = *Ptychocoleus Hasskarlianus* (Gottsche) Steph.

Lejeunea ligulata (Lehm. und Lindenb.) Mitt. 1861 Hep. Ind. Or. p. 110; Steph. 1898, in Besch. J. de Bot. XII, Sep. p. 6. Cf. sub *Mastigolejeunea.*

Lejeunea mariana Gottsche 1845, Syn. Hepat., p. 337 = *Archilejeunea mariana* (Gottsche) Steph.

Lejeunea marquesiana Steph. 1998 nom. nud., in Besch., J. de Bot. XII, Sep. p. 4 = Cf. sub. *Ptychocoleus marquesianus* (Steph.) Steph.

Lejeunea mollis (Hook. f. et Tayl.) Mitt. 1855, Fl. Nov. Zel. II : 156 = *Ptychocoleus mollis* (Hk. f. et Tayl.) Steph.

Lejeunea olivacea (Hk f. et Tayl.) Syn. Hepat. 1845, p. 334 = *Archilejeunea olivacea* (Hk. f. et Tayl.) Steph.

Lejeunea ophiocephala Mitt. 1855, Fl. of New Zealand II:156; Hook. f. 1864—67 Handb. Ned Zealand Fl. p. 532 = *Thysananthus ophiocephalus* Tayl., welche zu *Thys. anguiformis* Hook et Tayl. gehört.

Lejeunea pallida (Aongstr.) Steph. 1898, in Besch., J. de Bot. XII, Sep. p. 4 = *Ptychocoleus pallidus* (Aongstr.) Steph.

Lejeunea plicatiscypha Syn. Hepat. 1847 pag. 748 = *Lopholejeunea plicatiscypha* (Hook. f. et Tayl.) Steph.

Lejeunea procumbens Mitt. 1871, Flora vitiensis p. 413. Stephani stellt die Pflanze zu *Hygrolejeunea.* Da er aber nur die kurze Diagnose Mitten's wiederholt, hat er wahrscheinlich kein Material gesehen. Es konnte sich auch um irgend eine Art der Holostipae handeln.

Lejeunea renistipula Gottsche in sched. = *Lopholejeunea Vescoana* Steph. = *Lopholejeunea eulopha* (Tayl.) Spr. Cf. besonders Steph. 1898 in Besch., J. de Botan. XII, Sep. p. 5 (no. 22).

Lejeunea samoana Mitt. 1871, Fl. vitiensis p. 415 = *Archilej. samoana* Steph. = *Archilejeunea mariana* (Gottsche) Steph.

Lejeunea sandvicensis Evs. 1892 Transact. Conn. Ac. VIII : 253, Steph. 1898, in Besch. J. de Bot. XII, Sep. p. 4 = *Brachiolejeunea sandvicensis* (Gottsche) Evs.

Lejeunea scutellata (Hk. f. et Tayl.) Mitt. 1855, Fl. Nov. Zel. II : 155 = *Archilejeunea scutellata* (Hk. f. et Tayl.) Steph.

Lejeunea squamata (Willd.) Nees 1845, Syn. Hepat. 322, Cf. sub *Stictolejeunea squamata.*

Lejeunea Stephensoniana Mitt. 1855, Fl. Nov. Zel. II: 155, Cf. sub *Ptychanthus.*

Lejeunea subfusca (Nees) Syn. Hepat. 1845, p. 315; Steph. 1897, in Besch., J. de Bot. XII, Sep. p. 6 = *Lopholejeunea subfusca* (Nees) Steph.

Lejeunea subsquarrosa Aust. 1874, Bull. Torrey Bot. Club V: 15 = *Brachiolej. sandvicensis* (Gottsche) Evs.

Lejeunea taitica (nec **tahitica**) (Gottsche in sched. et in ic.) Steph. nom. nud. 1898, J. de Bot. XII, Sep. p. 6 = *Mastigolej. humilis* (Gottsche) Spr.

Lejeunea transversalis Hookeriana Syn. Hepat. 1845, p 311 = *Symbyezidium bacciferum* (Tayl.) Steph.

Lejeunea Vieillardii Gottsche in sched. = *Lopholejeunea eulopha* (Tayl.) Spr.

Lejeunea virens (Aongstr.) Steph. 1898, J. de Bot. XII, Sep. p. 7 = *Mastigolejeunea humilis* (Gottsche) Spr.

15. **Lopholejeunea australis** Steph. 1912, Spec. Hepat. V : 96 ist nahe verwandt mit *L. subfusca,* lässt sich aber wohl spezifisch trennen durch die etwas anders gebildeten Lobuli, durch die ganzrandigen laterad gerichteten Lobi inv. ♀, und durch das freie, nur mit einigen kleinen Stacheln versehene Perianth. *L. australis* zeigt hier und da zugespitzte Lobi, ohne jedoch mit *L. nigricans* etc. verwandt zu sein. *L. subfusca* ist mir aus Australien unbekannt. — Australien (N. S. Wales).

Lopholejeunea caledonica St. in sched. = *Archilejeunea incrassata* Steph.

16. **Lopholejeunea Colensoi** Steph. 1892, J. Linn. Soc. Bot. 29: 268; 1912, Spec. Hepat. V: 97. Durch sehr breite Lobuli, einen eigentümlichen eingebogenen postikalen Lobusrand und die zahlreichen, länglichen, ganzrandigen Auswüchse, welche das Perianth völlig bedecken, gut charakterisiert. *L. latilobula* Verd. aus Neu-Guinea hat ähnliche Lobuli. Der

Lobusrand verläuft jedoch anders, die ♀ Involucralblätter sind im Gegensatz zu denen von *L. Colensoi* deutlich gezähnt, während die Kiele des Peranths, obwohl ziemlich gross und fransig gezähnt, gar nicht mit denen der *L. Colensoi* übereinstimmen. Neu-Seeland.

17. **Lopholejeunea eulopha** (Tayl.) Spr. 1884, Hepat. Amaz. et Andin. pag. 120. Die Gestalt der Lobuli, sowohl an den gewöhnlichen Blättern, wie auch im ♀ Involucrum, ist sehr variabel und kann sogar an derselben Pflanze stark wechselen (Spitze!) Die Lobi sind an fertilen Aesten bisweilen deutlich zugespitzt. Cf. de Frull. XV. Nikobaren, Sumatra, Malayische Halbinsel, Java, Borneo, Philippinen, Halmaheira, Ambon, Neu-Guinea, Australien (Queensland), Norfolk-Insel, Neu-Kaledonien, Fidschi Inseln, Samoa, Tahiti.

Lopholejeunea falcifolia Steph. in sched. = *Lopholejeunea Knightii* Steph.

Lopholejeunea fimbriata Schffn. 1890, Forschungsreise Gazelle IV:28 = *Lopholejeunea eulopha* (Tayl.) Spr.

18. **Lopholejeunea Finschiana** Steph 1896, Hedwigia 35:109; 1912, Spec. Hepat. V.83. Wahrscheinlich eine gute, vielleicht endemische Art, welche durch die Lobuli (die aber am Originalmaterial nicht so gut entwickelt sind), durch grosse, runde, ganzrandige, das Perianthium völlig bedeckende Amphigastrien inv. ♀, sowie durch ein kleines rundes Perianthium mit grob gestachelten carinae ausreichend charakterisiert sein dürfte. Die ♀ Involucralbl. sind deutlich gezähnt und laterad gerichtet. Marschall Inseln.

Lopholejeunea gibbosa (Aongstr. 1872 nec 1873) Steph. 1897, Bull. Herb. Boiss. V:842 = *Lopholejeunea subnuda* (Mitt.) Steph. Nach Evans 1900, Transact. Conn. Ac. X:414; cf. auch sub *Phragmicoma gibbosa* Aongstr.

Lopholejeunea grossealata Steph. 1912, Spec. Hepat. V:95 = *Lopholejeunea Knightii* Steph.

Lopholejeunea hawaica Steph. 1912, Spec. Hepat V:87 = *Lopholejeunea subnuda* (Mitt.) Steph.

19. **Lopholejeunea hispidissima** Steph. 1912, Spec. Hepat. V:80. Diese schöne endemische Art ist durch Lobi und Lobuli inv. ♀, welche in einer stachelartigen Spitze enden, und durch die grossen in zahlreichen lilienartigen Lappen auslaufenden Kiele des Perianthium charakterisiert. Neu-Kaledonien.

Lopholejeunea ? immersa (Mitt.) Steph. 1912, Spec. Hepat. V : 94 = *Lopholejeunea eulopha* (Tayl.) Spr.

Lopholejeunea javanica (Nees) Steph. 1890, Hedwigia 29: 16; 1907, Denkschr. Ak. Wiss. Wien 81: 99. STEPHANI's Angabe beruht auf einem Irrtum, da *Lopholej. javanica,* übrigens eine zweifelhafte Art, auf die engere Indomalaya beschränkt ist.

Lopholejeunea kermadacensis Steph. in sched. = *Lopholejeunea plicatiscypa* (Hk. f. et Tayl.) Steph.

20. **Lopholejeunea Knightii** Steph. 1896, Hedwigia 35 : 110; 1912, Spec. Hepat. V: 95. Hierher gehört jedenfalls *L. grossealata.* Ich halte es ausserdem für sehr wahrscheinlich, dass *L. Knightii* keine eigene Art ist, sondern zu *L. plicatiscypha* gehört. Nur nach dem Studium der Typen, kann ich darüber nicht mit Sicherheit entscheiden. Ich glaube jedoch, dass die Unterschiede, welche ich zwischen den beiden Sippen angeben kann: kleine Unterschiede in der Insertion der Amphigastrien, in der Form der Lobuli, grob gezähnte Perianthkiele bei *L. Knightii* und kleinere weniger gezähnte Kiele bei *L. plicatiscypha,* keine spezifische Trennung rechtfertigen. Ost-Australien.

Lopholejeunea laceriloba Steph. 1923, Spec. Hepat. VI : 379 = *Lopholejeunea eulopha* (Tayl.) Spr.

Lopholejeunea ? Mannii (Aust.) Steph. 1897, Bull. Herb. Boiss. V: 842; 1912, Spec. Hepat. V: 94 = *Lopholejeunea subnuda* (Mitt.) Steph.

21. **Lopholejeunea muensis** Steph. 1896, Hedwigia 35 : 110; 1912, Spec. Hepat. V: 93. Das Originalmaterial stammt von dem Berge Mou und wurde von BALANSA gesammelt. GOTTSCHE hat die Art schon (in M. S.) unterschieden. Einige andere Lopholejeuneen, welche in STEPHANI's Herbar als *L. muensis* liegen, gehören nicht hierher. Nahe verwandt ist *L. latilobula* Verd. aus Neu-Guinea, welche jedoch anders gestaltete Lobuli, breitere Amphigastrien, grosse, immer gut entwickelte, zugespitzte Lobuli inv. ♀ hat. Das Amphigastrium intimum inv. beider Arten ist gezähnt. *L. Colensoi* ist durch die ganz anders verlaufende margo postica der Lobuli und besonders durch das Perianthium gleich zu unterscheiden. Neu-Kaledonien.

22. **Lopholejeunea multiflora** Jack und Steph. 1894, Bot. Centralbl. 60: Sep. p. 9; Steph. 1912, Spec. Hepat. V: 79. Soweit ich aus dem dürftigen und schlecht erhaltenen Originalmaterial schliessen kann, eine gute Art, charakterisiert durch manchmal (aber nicht immer) zugespitzte Lobi und besonders durch das Perianthum, länglich umgekehrt birn-

förmig mit mächtig entwickelten aber nur im oberen Teil vorhandenen Cristae. Amphig. inv. ♀ int. ganzrandig, klein; Lobuli kaum entwickelt; Lobi etwas gezähnt, nicht zugespitzt. Bemerkenswert sind die kleinblättrigen Aeste mit sehr grossen, gut entwickelten Lobuli und dreieckig zugespitzte Lobi. Fidschi Inseln.

23. **Lopholejeunea norfolkiensis** Steph. 1889, Hedwigia 28; 1912, Spec. Hepat. V: 96. Ich konnte nur einige schlecht entwickelte Aeste untersuchen, halte es aber kaum für wahrscheinlich, dass eine von *L. eulopha* zu trennende Art vorliegt. Norfolk Inseln.

Lopholejeunea Novae Guinea Steph. 1912, Spec. Hepat. V: 90, welche auch für Tahiti angegeben wird, gehört (cf. Nova Guinea, Bot., vol. XIV) zu *Lopholejeunea eulopha* (Tayl.) Spr.

Lopholejeunea oceanica (Mitt.) Steph. 1923, Spec. Hepat. VI: 378 = *Certatolejeunea* sp. Ich habe das Originalmaterial (leg. POWELL) aus MITTEN's Herbar untersucht. Uebrigens kann man aus der Original-Diagnose schon schliessen, dass es sich um eine *Ceratolejeunea* handelt. In den Icones von STEPHANI ist nicht MITTEN's Original abgebildet, doch wird dies wohl als Original von *Lopholejeunea oceanica* Steph. zitiert. (Cf. MITTEN 1871 Fl. vitiensis p. 414).

Lopholejeunea owahuensis Steph. 1896, Hedwigia 35: 11 = *Lopholejeunea subnuda* (Mitt.) Steph.

24. **Lopholejeunea parva** Steph. (nec. Schffn.) 1907, Denkschr. Ak. Wiss. Wien. 81: 295; 1912, Spec. Hepat. V: 90. Dass das Autorenzitat „Schffn'' in den Species Hepaticarum auf ein Irrtum beruht, habe ich in de Frull. XII, Ann. Bryol. VII: 80 schon angegeben. Die Pflanze von Samoa ist, besonders was die ♀ Infl. anbelangt, der malayischen *L. horticola* Schffn. nicht unähnlich, unterscheidet sich aber durch den monözischen Blütenstand und kleinere anders geformte Lobuli. Samoa.

25. **Lopholejeunea plicatiscypa** (Hook. f. et Tayl.) Steph. 1912, Spec. Hepat. V: 96. Von den von STEPHANI angeführten Synonymen gehören nur die ersten zwei hierher. Ost-Australien, Neu Seeland, Kermadec Inseln.

26. **Lopholejeunea proxima** Steph. 1912, Spec. Hepat. V: 89. Das Originalmaterial, welches auch in den Ic. Ined. abgebildet ist, unterscheidet sich nicht so stark von *L. subnuda*, dass man bei erster Untersuchung gleich von der Notwendigkeit einer spezifischen Trennung überzeugt wird. Glücklicherweise fand ich jedoch unter anderen von FAURIE bei Kalung gesammelten Lebermoosen (FAURIE n. 35) Material, das mit Sicherheit lehrt, dass auf Hawaii ausser der seit alten Zeit bekannten

L. subnuda noch eine Art vorkommt. Diese unterscheidet sich durch einen etwas länglicheren Lobulus, durch meistens ziemlich deutlich zugespitzte Lobi (welche an anderen Pfl. auch abgerundet sein können), durch den deutlichen Lobulus im ♀ Involucrum, durch deutlich gezähnte ♀ Involucralbl., durch meistens gezähnte Amphigastrien (runder und grösser als bei *L. subnuda*) und durch ein etwas kürzeres mit reichlich gezähnten Kielen versehenes Perianth. H a w a i i (Kauai).

Lopholejeunea pterocalyx Steph. in sched. = *Lopholejeunea Knightii* Steph.

Lopholejeunea pyriflora Steph. 1912, Spec. Hepat. V : 88; Verd. 1932, de Frull. XII : 83 = *Lopholejeunea subfusca.* Ich konnte nun auch das Original untersuchen.

27. **Lopholejeunea Reineckeana** Steph. 1912, Spec. Hepat. V : 78. Eine schöne Art. Das Perianthium erinnert etwas an *L. multiflora,* aber vegetativ stimmt *L. Reineckeana* z.B. viel mehr mit *L. applanata* überein. Durch das riesige Perianth mit den grossen tief zerschlitzten Cristae leicht von den Verwandten zu unterscheiden. *L. Reinckeana* zeigt einen langen gut entwickelten Hauptstamm mit kurzen Seitenästen an den Enden. S a m o a.

Lopholejeunea ? renistipula (Mitt.) Steph. 1912 Spec. Hepat. V : 94. MITTEN's Original war nicht aufzufinden.

Lopholejeunea Sagraeana (Mont.) Spr. Diese Art, welche früher manchmal mit *L. subfusca* verwechselt wurde, kommt nicht in Asien oder Ozeanien vor. In THÉRIOT's Neu-Kaledonienexsiccaten ist aber sub no. 121 *L. Sagraeana* (det. STEPHANI) herausgegeben. Ich habe in mehreren Herbarien no. 121 des betreffenden Exiccates untersucht, finde aber immer ein Gemisch von Schizostipae, Laubmoosen und *Lophole j. culopha.*

28. **Lopholejeunea subfusca** (Nees) Steph. 1890, Hedwigia 29 : 16. Cf. de Frull. XV. V o r d e r i n d i e n, C e y l o n, S u m a t r a, P. P e n a n g, J a v a, M a l. H a l b i n s e l, B o r n e o, P h i l i p p i n e n, B a n d a, A m b o n, N e u - G u i n e a, N e u - K a l e d o n i e n, S a m o a, T a h i t i.

29. **Lopholejeunea subnuda** (Mitt.) Steph. 1897, Bull. Herb. Boiss. V : 842; Evans 1900, Transact. Conn. Acad. X : 414. H a w a i i.

Lopholejeunea tecta (Mitt.) Steph. 1912 Spec. Hepat. V : 85 = *Lopholejeunea plicatiscypha* (Hk. f. et Tayl.) Steph. Das Originalmaterial stammt von den Kermadec Inseln, nicht von den Fidschi Inseln, wie STEPHANI l. c. angibt.

Lopholejeunea Vescoana Steph. 1923, Spec. Hepat. VI : 379 ≐

Lopholejeunea eulopha (Tayl.) Spr. Die von mir untersuchten Teile des Originals von *L. Vescoana* waren steril, es ist daher nicht unmöglich, dass die ♀ Infl. nicht mit denen von *L. eulopha* übereinstimmen, doch ist dies nicht wahrscheinlich.

30. **Lopholejeunea yapensis** Steph. 1912, Spec. Hepat. V: 81. Diese Art gehört in den Formenkreis von *L. subfusca.* Möglicherweise handelt es sich um eine lokal konstante Form, wie man dies bei *Lopholej. subfusca* öfters beobachten kann. Charakteristisch wären dann die grossen breit zungenförmigen Lobuli (die aber am Originalmaterial nicht immer so aussehen, wie STEPHANI sie abbildete) und das vollkommen ganzrandige Involucrum. Karolinen (Yap.).

Marchesinia bacciferum Trev. 1877, Mem. Ist. Lomb. III, IV: 405 = *Symbyezidium bacciferum* (Tayl.) Steph.

31. **Marchesinia Mittenii** Evs. 1900, Transact. Conn. Ac. X: 422. — Hawaii.

Mastigolejeunea apiculata Steph. 1897, in Besch., J. de Botan. XII, Sep. p. 6 = wahrscheinlich *Brachiolejeunea apiculata* Steph = *Thysananthus polymorphus.*

Mastigolejeunea appendiculifolia Steph 1912, Spec. Hepat. IV : 773 = *Mastigolejeunea humilis* (Gottsche) Spr.

Mastigolejeunea auriculata (Wils. et Hk) Schffn. cf. sub *Phragmicoma versicolor* L. et L.

Mastigolejeunea badia Steph. 1912, Spec. Hepat. IV : 779. Diese Pflanze stammt von Vanicoro und wurde von BECHERELLE an GOTTSCHE geschickt. In den Ic. Ined. ist sie als „*Acrolej. badia* (Gottsche) St." bezeichnet. Es handelt sich entweder um eine robuste *Mastigolejeunea* oder um eine *Ptychocoleus.* Das Original ist aber weder in Paris noch in Berlin vorhanden.

32. **Mastigolejeunea calcarata** (Mitt.) comb nov. Lobi deutlich oder breitdreieckich zugespitzt, Lobuli laufen in eine längliche Spitze aus (wie auf Java bei montanen Formen von *M. humilis*). Durch die Lobi, deren Spitzen und Marginae anticae manchmal völlig eingerollt sind, von *M. humilis* zu unterscheiden. Die Pflanze, welche vom Bureau of Science in Manila sub no. 10498 als „*Mastigolej. spiniloba* St. n. sp." distribuiert worden sind, gehören zu *M. humilis* und stimmen mit *M. spiniloba* nur in der Gestalt der Lobuli überein. Fidschi Inseln.

33. **Mastigolejeunea Frauenfeldii** (Reich.) Steph. 1890, Hedwigia **29**: 139. Steht der *M. atypos* sehr nahe. Diese ist aber doppelt so gross, die Lobi haben ein deutliches rundes freies Appendiculum anticum, das

bei *M. gibbosa* fehlt oder jedenfalls nur undeutlich ausgebildet ist. Die Lobuli von *M. gibbosa* sind flach und laufen in einer geraden Spitze aus, während die Lobuli von *M. atypos* stumpf sind und mit dem teilweise eingerollten postikalen Lobusrand eine grössere Auricula bilden. Die verwandte *M. spiniloba* ist grösser, hat ganz andere Lobi etc. Die viel kleinere *M. ligulata* hat andere Lobuli, Amphigastrien etc., ist aber näher verwandt. Von allen genannten Arten ist *M. Frauenfeldii* dann noch wesentlich verschieden durch die grosse Anzahl von accezorischen Kielen auf dem Perianthium. Es ist interessant, wie sehr die Formen der ♀ Infl. der Gattung *Mastigolejeunea* wechseln können, während bei den meisten Arten aus einer Gattung die Blätter und Amphigastrien des ♀ Invol. nur geringe Unterschiede aufweisen. T a h i t i.

Mastigolejeunea guahamensis (Lindenb.) Steph. 1912. Spec. Hepat. IV : 769 = *Mastigolejeunea humilis* (Gottsche) Spr.

Mastigolejeunea honoluluana Steph. 1924, Spec. Hepat. VI : 562 = *Lopholejeunea subnuda* (Mitt.) Steph.

34. **Mastigolejeunea humilis** (Gottsche) Spr. 1884. Hepat. Amaz. et Andin. p. 101. Cf. de Frull. XV. A n n a m, A n d a m a n e n, C e y l o n, S u m a t r a, J a v a, B a n d a, M a l. H a l b i n s e l, P h i l i p p i n e n, C e l e b e s, A m b o n, N e u - G u i n e a, M i o k o, M a r i a n e n, N e u - P o m m e r n, N e u - K a l e d o n i e n, F i d s c h i I n s e l n, S a m o a, T a h i t i.

35. **Mastigolejeunea integrifolius** (Steph.) Verd. comb. nov. Diese höchst merkwürdige Pflanze hat mit *Thysananthus* nichts zu tun, jedoch ist ihre genaue Stellung zweifelhaft. Die Blätter sind nämlich typische *Ptychocoleus*- oder *Brachiolejeunea*-Blätter, dagegen die Stellung der ♀ Infl., das ♀ Inv. und Perianthium ganz typisch nach dem *Mastigolejeunea*-Plan. Einigermassen verwandte Arten kenne ich nicht. P o s s e s s i o n I s l a n d (Torres Street).

Mastigolejeunea ligulata (Lehm. und Lindenb.) Spr. 1884, Hepat. Amaz. et Andin. pag. 101. Kommt, so weit ich feststellen kann, im Gebiet nicht vor. Die Angaben von MITTEN und STEPHANI beziehen sich auf andere Arten.

Mastigolejeunea Novae Zelandiae Steph. 1912, Spec. Hepat. IV : 779 = *Archilejeunea scutellata* (Hk. f. et Tayl.) Steph.

Mastigolejeunea novohibernica Schffn. 1890, Forschungsreise Gazelle IV : 23. Diese Art, welche zu *Mastigolej. ligulata* (Lehm. and Lindenb.) Spr. gehört, wird von STEPHANI (Spec. Hepat. IV : 770) für Tahiti angeführt. Diese Angabe bezieht sich aber auf *Mastigolej. Frauenfeldii* (Reich.) Steph.

36. **Mastigolejeunea Pancheri** (Gottsche msc.) Steph. 1912, Spec. Hepat. IV: 771. Da die Pflanze steril ist, ist die Gattungsbezeichnung unter Umstände nicht richtig, dies halte ich jedoch kaum für wahrscheinlich, jedenfalls handelt es sich um eine vorzüglich charakterisierte und allem Anscheine nach endemische Art. Von *A. samoana* (= *A. caramuensis*), *M. atypos* und anderen Arten leicht zu unterscheiden durch Grösse und Habitus, durch Gestalt und Faltung der Lobi, durch Form und Grösse der Amphigastrien. Neu-Kaledonien.

37. **Mastigolejeunea phaea** (Gottsche msc.) Steph. 1889, Hedwigia 28; 1912, Spec. Hepat. IV: 780. Durch auffallende Breite, zugespitzte Lobi, eingerollte in einer Spitze auslaufende Lobuli und das nicht völlig ganzrandige Involucrum charakterisiert. Australien (nicht im Nord Osten).

Mastigolejeunea recurvistipula Steph. 1912, Spec. Hepat. IV: 781 = *Mastigolejeunea phaea* (Gottsche msc.) Steph.

Mastigolejeunea sandvicensis Steph. 1889, Hedwigia 28 : 29 = *Brachiolejeunea sandvicensis* (Gottsche) Steph.

Mastigolejeunea spiniloba Steph. 1912, Spec. Hepat. IV: 775 = *Mastigolejeunea calcarata* (Mitt.) Verd.

• **Mastigolejeunea taitica** (Gottsche msc.) Steph. 1896, Hedwigia 35: 112; 1912, Spec. Hepat. IV: 775 = *Mastigolejeunea humilis* (Gottsche) Spr., auch die zahlreichen anderen Pflanzen, welche in STEPHANI's Herbar als *M. tahitica* liegen, gehören hierher.

38. **Mastigolejeunea vanicorensis** (Steph.) Verd. comb. nov. Durch die zugespitzten Lobi, die Gestalt der Lobuli und die länglichen, tiefer gefalteten Perianthien von den robusten Formen von *M. humilis* zu unterscheiden. Vanicoro.

Mastigolejeunea virens (Aongstr.) Steph. 1912, Spec. Hepat. IV: 776 *Mastigolejeunea humilis* (Gottsche) Spr.

Mastigolejeunea Volkensii Steph. 1912, Spec. Hepat. IV : 777 = *Hygrolejeunea* sp. (Cf. de Frull. XV).

. **Mastigolejeunea Wattsiana** Steph. 1912, Spec. Hepat. IV : 780 = *Mastigolejeunea phaea* (Gottsche msc.) Steph.

Odontolejeunea ? contractilis (Mitt.) Steph. 1912, Spec. Hepat. V: 182 = *Caudalejeunea renistipula* (Gottsche) Steph.

Phragmicoma aulocophora Mont. 1843, Ann. Sc. Nat. Bot. 19: 259; Mitt. 1871, Fl. vitiensis p. 412 = *Ptychocoleus aulacophorus* (Mt.) St.

Phragmicoma baccifera Tayl. 1846, L. Journ. of Bot. V : 387 = *Symbyezidium bacciferum* (Tayl.) Steph.

Phragmicoma bicolor Mont. (nec. Nees) 1846, Voyage Bonité, pag. 223 = *Brachiolejeunea sandvicensis* (Gottsche) Evs.

Phragmicoma bilabiata Mitt. 1871, Fl. vitiensis p. 412. Das Originalmaterial ist nirgends aufzufinden.

Phragmicoma calcarata Mitt. 1871, Fl. vitiensis p. 413 = *Mastigolejeunea calcarata* (Mitt.) comb. nov.

Phragmicoma contractilis Mitt. 1871, Flora vitiensis p. 412 = *Caudalejeunea renistipula* (Gottsche) Steph.

Phragmicoma renistipula Mitt. 1871, Fl. vitiensis p. 412 gehört zu *Mastigolejeunea humilis,* nicht zu *Harpalejeunea,* wie STEPHANI 1913, Spec. Hepat. V:267 angibt. Die Originale stammen vom Isle of Pines (Miln, Strange) und von den „Pacific Islands'' (Beecher).

Phragmicoma Eavesiana Gottsche in Müll., 1880, Fragm. Phytog. Austr. XI:63 = *Archilejeunea scutellata* (Hk. f. et Tayl.) Steph.

Phragmicoma gibbosa Aongstr. 1873, Oefv. K. Vet. Ak. Förh. 1873, no. 5, pag. 133 (nec 1872, pag. 23!) = *Mastigolejeunea Frauenfeldii* (Reich.) St. Man achte darauf, dass *Lejeunea gibbosa* Aongstr. und *Phragmicoma gibbosa* Aongstr. nichts mit einander zu tun haben. STEPHANI 1898 (in Besch., J. de Bot. XII, Sep. p. 4) hat beide zusammen gezogen!

Phragmicoma eulopha (Tayl.) Mitt. 1871, Fl. vitiensis p. 413 = *Lopholejeunea eulopha* (Tayl.) Spr.

Phragmicoma immersa Mitt. 1871, Fl. vitiensis p. 412 = *Lopholejeunea eulopha* (Tayl.) Spr.

Phragmicoma ligulata (L. et L.) Mitt., 1871, Fl. vit. p. 412 = *Mastigolejeunea ligulata* (L. et L.) Spr.

Phragmicoma Mannii Aust. 1874, Bull. Torrey Bot. Club V:15 = *Lopholejeunea subnuda* (Mitt.) Steph.

Phragmicoma olivacea (Hook. f. et Tayl.) Mitt. 1855, Fl. Nov. Zel. p. 157; 1871, Fl. vitiensis p. 412; Hook. f. 1864—67, Handb. p. 532 = *Archilejeunea olivacea* (Hk. f. et Tayl.) Steph.

Phragmicoma Pancheri Gottsche in sched. = *Mastigolejeunea Pancheri* Steph.

Phragmicoma pallida Aongstr. 1873, Oefv. Kgl. Sv. Vet. Ak. Förh. 1873, no. 5, p. 132 = *Ptychocoleus pallidus* Steph.

Phragmicoma plana (Sde Lac.) Mitt. 1871, Fl. vitiensis, p. 412 = *Thysananthus planus* Sde Lac.

Phragmicoma plicatiscypha Hook. f. et Tayl. 1846, L. Journ. of Bot. III:386 = *Lopholejeunea plicatiscypha* (Hk. f. et Tayl.). Mit

Thysananthus anguiformis (cf. Hooker f., Handb. p. 533) hat diese Pflanze nichts zu tun.

Phragmicoma renistipula Mitt. 1871, Fl. vitiensis p. 413. Cf. sub *Lopholejeunea.*

Phragmicoma polyantha Jack in sched. = (nach Steph. in ic. ined.) *Mastigolejeunea taitica* (G. msc.) St. = *M. humilis* (Gottsche) Spr.

Phragmicoma sandvicensis Gottsche 1857, Ann. Sc. Nat. IV, VIII:344 = *Brachiolejeunea sandvicensis* (Gottsche) Evs.

Phragmicoma securifolia (Endl.) Nees 1845, Syn. Hepat. p. 300 = *Ptychocoleus securifolius* (Endl.) Steph.

Phragmicoma taitica Gottsche in sched. et in icon. = *Mastigolejeunea humilis* (Gottsche) Spr.

Phragmicoma subnuda Mitt. 1871, Fl. vitiensis p. 412 = *Lopholejeunea subnuda* (Mitt.) Steph.

Phragmicoma subsquarrosa Aust. 1869, Proc. Ac. Nat. Sci. Phil. for 1869, p. 225 = *Brachiolejeunea sandvicensis* (Gottsche) Evs.

Phragmicoma tecta Mitt. 1871, Flora vitiensis p. 412 = *Lopholejeunea plicatiscypha* (Hk. f. et Tayl.) Steph.

Phragmicoma Thozetiana Gottsche et Müller 1880, Fragm. Phyt. Austr. XI: 63 = *Brachiolejeunea Thozetiana* (G. et M.) Steph.

Phragmicoma tumida (Nees) Mitt. 1871, Fl. vitiensis p. 412 = *Ptychocoleus tumidus* (Nees) Trev.

Phragmicoma versicolor Lehm. et Lindenb. Diese Pflanze, welche zu der neotropischen *Mastigolejeunea auriculata* gehört, wird von MONTAGNE (1848, Ann. Sc. Nat. Bot. 3, 10: 112) und von REICHARDT (1870, Reise der Novara, p. 155) für Tahiti angeführt. Es handelt sich zweifellos um die auf Tahiti sehr häufige *M. humilis.*

Platylejeunea baccifera Steph. 1890, Hedwigia 29: 6 = *Symbyezidium bacciferum* (Tayl.) Steph.

Platylejeunea cryptocarpa (Mitt.) Steph. 1897, Bull. Herb. Boiss. V: 842.

Platylejeunea samoana Steph. 1907, Denkschr. Ak. Wiss. Wien 81: 297 = *Symbyezidium samoanum.*

Ptychanthus Brotheri Steph. 1912, Spec. Hepat. IV: 751 = *Ptychanthus striatus* (Lehm. und Lindenb.) Nees.

Ptychanthus mollis Hook f. et Tayl., 1846 L. Journ. of Bot. III: 384 = *Ptychocoleus mollis* (Hk. f. et Tayl.) Steph.

Ptychanthus rhombifolius Steph. in sched. = *Ptychanthus striatus* (L. et L.) Nees.

Ptychanthus samoanus Steph. in sched. = *Ptychanthus striatus* (L. et L.) Nees.

Phychanthus Stephensonianus (Mitt.) Steph. 1912, Spec. Hepat. IV: 754 = *Ptych. striatus* var. *intermedius* (Gottsche). Cf. de Frull. XV.

39. **Ptychanthus striatus** (L. et L.) Nees 1838, Naturgesch. Eur. Leberm. III: 212. Cf. de Frull. XV. Centralafrika, Südafrika, Madagascar, Japan, China, Himalaya, Birma, Siam, Vorderindien, Ceylon, Andamanen, Sumatra, Java, Mal. Halbinsel, Borneo, Philippinen, Celebes, Halmaheira, Ambon, Neu-Guinea, Neue Hebriden, Samoa, Australien, Neu-Seeland.

40. **Ptychocoleus aulacophorus** (Mont.) Steph. 1912, Spec. Hepat. V: 38. Cf. de Frull. XV. Philippinen, Neu-Guinea, Manga Reva, Salomon-Inseln, Samoa.

Ptychocoleus brunneus Steph. 1912, Spec. Hepat. V : 38 = Ptychocoleus pycnocladus (Tayl.) Steph.

41. **Ptychocoleus caledonicus** Steph. 1912, Spec. Hepat. V : 39. Stimmt in Grösse und Form der Amphigastrien mit Ptychoc. aulocophorus überein. Lobuli aber wie bei einem zarten P. fertilis, mit 2—4 schwach entwickelten Zähnchen versehen. Lobulus nur wenig kleiner als der Lobus, hoch mit diesem verwachsen. Viel lässt sich über diese Art nicht sagen, da das zu Verfügung stehende Material zu spärlich ist. Die Pflanze wurde in THÉRIOT's Musci et Hep. Nov. Caled. Exsicc. sub no. 116 herausgegeben. Meistens findet man in dieser no. nur musci. Neu-Kaledonien.

42. **Ptychocoleus Cumingianus** (Mont.) Trevis. 1877, Mem. Ist. Lomb. III, IV: 405. Cf. de Frull. XV. Nikobaren, Andamanen, Sumatra, Java, Mal. Halbinsel, Borneo, Philippinen, Celebes, Ambon, Ceram, Neu-Guinea, Karolinen, Australien (Queensland), Samoa, Tahiti, Marquesas Inseln.

43. **Ptychocoleus fertilis.** (Rw. Bl. N.) Trev. 1877, Mem. Ist. Lomb. III, IV: 405. Cf. de Frull. XV. Nikobaren, Sumatra, Penang, Mal. Halbinsel, P. Weh, Java, Philippinen, Neu-Guinea, Tahiti.

44. **Ptychocoleus Hasskarlianus** (Gottsche) Steph. 1912, Spec. Hepat. V: 44. Cf. de Frull. XV. Sumatra, Java, Borneo, Ambon, Bougainville, Samoa, Tahiti.

45. **Ptychocoleus laxus** Steph. 1912, Spec. Hepat. V : 46. Das

spärliche Originalmaterial macht deutlich den Eindruck, dass es unter abnormen, sehr feuchten Bedingungen aufgewachsen ist. Man kann nicht entscheiden, ob es sich um eine abnorme hyrophile laxa Modifikation handelt, oder ob eine eigene endemische Art vorliegt. Neu-Kaledonien.

Ptychocoleus marquesianus (Steph.) Steph. 1912, Spec. Hepat. V:48 = Ptychoc. Cumingianus (Mt.) Trevis. Im Herbar STEPHANI liegt aber auch P. Hasskarlianus (von Tahiti) unter dem Namen *Ptychoc. marquesianus*.

46. **Ptychocoleus mollis** (Hook. f. et Tayl.) Steph. 1912, Spec. Hepat. V:59. Wird vermutlich identisch sein mit *P. securifolius* (Endl.) Steph., doch lässt sich darüber, solange das Originalmaterial nicht aufgefunden ist, nichts mit Bestimmtheit sagen. Jedenfalls hat die Art mit *Thysananthus* (womit MITTEN, Fl. New Zeal., p. 156—157 und HOOKER f., Handb. p. 532 sie vergleichen wollten) nichts zu tun. Es kann sich nur um eine *Ptychocoleus* handeln. Neu-Seeland, Bay of Islands (J. D. Hooker).

Ptychocoleus Novae Guineae (Steph.) Steph. 1912, Spec. Hepat. V:49. Das Original von Neu-Guinea gehört zu *Ptychocoleus Cumingianus*. Die zahlreichen Samoa-Pflanzen welche STEPHANI hierher stellte, gehören meistens zu *P. Hasskarlianus* oder sind Zwischenformen zwischen *P. Hasskarlianus* und *P. Cumingianus*, welche auf Samoa, wie in West-Java, sehr häufig sind.

Ptychocoleus papulosus Steph. 1912, Spec. Hepat. V :50 = *Ptychocoleus aulacophorus* (Mont.) Steph.

Ptychocoleus pallidus (Aongstr.) Steph. 1912, Spec. Hepat. V :50. Diese Art, konnte ich nicht untersuchen.

47. **Ptychocoleus parvus** Steph. 1912, Spec. Hepat. V :50 = *Ptychocoleus securifolius* (Endl.) Steph. In STEPHANI's Herbar fehlen Belege für die Angabe „Neu-Guinea". Selber hat STEPHANI Material, das WATTS 1901 am Richmond Fluss in N.S. Wales sammelte, als Typus bezeichnet (hb. Levier 3011), und dies wird auch in den Icones abgebildet. Es ist nicht gut erhalten, Perianthien sind nicht vorhanden, doch halte ich es für kaum wahrscheinlich, dass es sich um etwas anderes als *P. securifolia* handelt. Australien (N. S. Wales).

48. **Ptychocoleus pycnocladus** (Tayl.) Steph. 1912, Spec. Hepat. V:52. Cf. de Frull. XV. Ceylon, Andamanen, Penang, Sumatra, Mal. Halbinsel, Java, Borneo, Philippinen, Ambon, Neu-Guinea, Salomon Inseln, Samoa, Tahiti.

Ptychocoleus Rechingeri (Steph.) Steph. 1912, Spec. Hepat. V : 52. = *Ptychoc. Hasskarlianus* (Gottsche) Steph.

Ptychocoleus samoanus Steph. 1912, Spec. Hepat. V : 53 = *Ptychocoleus Hasskarlianus* (Gottsche) Steph.

49. **Ptychocoleus securifolius** (Endl.) Steph. 1912, Spec. Hepat. V: 59. — Ostaustralien, Norfolk Insel, Neu-Seeland.

Ptychocoleus setaceus Steph. 1912, Spec. Hepat. V : 54 = *Ptychocoleus Hasskarlianus* (Gottsche) Steph.

Ptychocoleus subinnovans Steph. 1912, Spec. Hepat. V : 56 = *Ptychocoleus pycnocladus* (Tayl.) Steph.

Ptychocoleus tumidus (Nees) Trev. 1877, Mem. Ist. Lomb. III, IV: 405. Wurde wahrscheinlich nie in Ozeanien gefunden. Cf. de Frull. XV.

50. **Ptychocoleus Wildii** Steph. 1912, Spec. Hepat. V: 60. So weit ich nach dem Studium des dürftigen Originals beurteilen kann, lässt sich diese Art gut von *P. securifolius* durch den monözischen Blütenstand und den stark distal verlängerten Kiel der Lobi und Lobuli unterscheiden. Australien (Queensland).

Ptycholejeunea elongata Steph. 1900, Transact. Conn. Ac. X : 423 = *Thysananthus polymorphus.*

Pycnolejeunea integristipula Jack und Steph. 1894, Bot. Centralbl. Vol. 60, Heft 4 = *Symbyezidium integristipulum* (J. et St.) Steph. Ich konnte das Original leider nicht bekommen; der Abbildung nach kann es sich kaum um eine andere Art handeln als *S. bacciferum* oder *S. cryptocarpum.*

Stictolejeunea squamata (Willd.) Schffn. Die Angaben „Hawaii" und „India" der Synopsis Hepaticarum beruhen entweder auf falschen Standortangaben, die damals nicht selten waren oder (wenigstens was Hawaii anbetrifft) auf einer Verwechselung mit *Symbyezidium.* EVANS 1900 (Transact. Conn. Ac. X) erwähnt die Angabe gar nicht.

51. **Symbyezidium bacciferum** (Tayl.) Steph. 1912, Spec. Hepat. V: 105. Um definitiv über die ozeanischen *Symbyezidium*-Arten urteilen zu können, wäre ein eingehendes Studium der neotropischen Arten und ihrer Variabilität notwendig. In neueren Kollektionen fehlt *Symbyezidium* fast immer. Was ich gesehen habe, macht einen so heterogenen Eindruck, dass ich unmöglich sagen kann, ob es sich um eine oder um mehrere Arten handelt. EVANS 1900 (Transact. Conn. Acad. X: 417—418) trennt *S. cryptocarpum* und *S. bacciferum,* ob dies richtig ist, weiss ich nicht. Das typische *S. cryptocarpum* hat tief inserierte ziemlich grosse Amphi-

gastrien, welche 1½ mal so breit sind als lang; es wurde in Australien und in Hawaii gesammelt. Das typische *S. cryptocarpum,* wovon ich aus MITTEN's Herbar das Original und andere von MITTEN hierher gestellte Exx. untersuchen konnte, hat runde, flach inserierte, kleine Amphigastrien; es wurde auf Hawaii, den Fidschi Inseln und Isle of Pines gesammelt.

52. **Symbyezidium cryptocarpum** (Mitt.) Steph. 1912, Spec. Hepat. V: 107. Cf. sub *S. bacciferum.*

Symbyezidium integristipulum (Jack und Steph.) Steph. 1912, Spec. Hepat. V: 106. Cf. sub *Pycnolejeunea.*

53. **Symbyezidium samoanum** (Steph.) Steph. 1912, Spec. Hepat. V: 106 unterscheidet sich von *S. bacciferum* durch die in eine gekrümmte freie Spitze auslaufenden Lobuli, durch runde, viel kleinere Amphigastrien, welche auch basal nicht so weit am Stamm herablaufen, wie dies bei *S. bacciferum* der Fall ist. Hierher gehört auch *S. cryptocarpum,* welche MITTEN 1871 (Fl. vit. p. 413) für Samoa (leg. POWELL) anführt. Samoa.

Thysanolejeunea plana Steph. 1889, Hedwigia 28 : 263 = *Thysananthus planus* Sde Lac.

Thysananthus abietinus (Spr. ms.) Steph. 1912, Spec. Hepat. V : 794 = *Thysananthus fruticosus* (Lindenb. et L.) Schffn.

54. **Thysananthus anguiformis** Hk. f. et Tayl. 1844, L. Journ. of Bot. III: 567; Syn. Hepat. 1845, pag. 289; Steph. 1912, Spec. Hepat. IV: 800. Steht *Thysananthus convolutus* wohl am nächsten, unterscheidet sich aber in vieler Hinsicht. Die Lobi sind zwar prinzipiell nach demselben Plan gebaut, aber an sterilen Stammteilen weniger und in den ♀ Infl. meistens gar nicht gezähnt. Dann sind die Lobuli proximal abgerundet und tragen eine deutliche, aus mehrere Zellen bestehende Spitze. ♀ Infl. klein, meistens mit nur einer Innovation. Man achte darauf, dass MITTEN und STEPHANI *Thys. anguiformis, Ptychocoleus mollis* und *Lopholejeunea plicatiscypha* mit einander verwechselt haben. Die Synonymenlisten STEPHANI's für diese Arten sind ganz falsch; komisch wirkt STEPHANI's Bemerkung in Spec. Hepat. IV: 800 (1912). Australien (Great Barrier Isl.), Neu-Seeland.

Thysananthus appendiculatus Steph. 1912, Spec. Hepat. IV : 794. Diese durch die eigentümlichen Appendicula am postikalen Lobusrande recht abweichende Art ist vermutlich auf Neu Guinea beschränkt. Das Material von der Norfolk Insel (das STEPHANI hierher stellte) gehört zu *Thys. fruticosus.*

Thysananthus Bowianus Steph. in sched. et in ic. ined. = *Thysananthus fruticosus* (Lindenb. et G.) Schff.

Thysananthus elongatus (Aust.) Evs. 1900, Transact. Conn. Ac. X: 423 = *Thysananthus polymorphus* Sde Lac.. In de Frullan. VIII habe ich *Frull. sandvicensis* nicht eingezogen, da es sich um eine typische lokale (lokal auch ziemlich konstante) Facies vom *Frull. squarrosa* handelte. Aus denselben Gründen könnte man *Thys. elongatus* aufrecht halten, sie ist jedoch weder auf Hawaii beschränkt, noch tritt sie in einer konstanten Form auf. Als einziges Unterscheidungsmerkmal ist anzuführen, dass die üppig entwickelten breiten Formen von *Thys. polymorphus* aus dem javanischen Urwalde nicht in Ozeanien gefunden wurden. Sonst stimmen beide Sippen in ihrer charakteristischen Variabilität so weit überein, dass ich sie (auch schon deswegen, weil ein kontinuierliches Areal vorliegt) nicht trennen kann.

Thysananthus Frauenfeldii Reich. 1870, Reise der Novara, pag. 155 = *Mastigolejeunea Frauenfeldii* (Reich.) Steph.

55. **Thysananthus fruticosus** (Lindenb. et S.) Schffn. 1893, Nat. Pflanzenf. 1, III : 130. Cf. de Frull. XV. Sumatra, Java, Banda, Mal. Halbinsel, Borneo, Philippinen, Celebes, Ceram, Neu Guinea, Neu Hannover, Neu Mecklenburg, Neue Hebriden, Australien (Queensland), Norfolk Insel, Neu Kaledonien, Fidschi Inseln, Samoa.

56. **Thysananthus Gottschei** (Jack. et Steph.) Steph. 1912, Spec. Hepat. IV: 787. Cf. de Frull. XV. Andamanen, Sumatra, Borneo, Philippinen, Neu Guinea, Neu Irland.

Thysananthus hebridensis Steph. 1924, Spec. Hepat. VI : 565 = *Thys. spathulistipus* (R. Bl. N.) Lindenb.

Thysananthus integrifolius Steph. 1912, Spec. Hepat. IV : 788 = *Mastigolejeunea integrifolia* (Steph.) Verd. comb. nov.

Thysananthus obtusifolius Steph. 1912, Spec. Hepat. IV : 792 = *Thysananthus polymorphus* Sde Lac.

Thysananthus ophiocephalus Tayl. 1846, L. Journ. of Bot. V : 384 = *Thysananthus anguiformis* Hk. f. et Tayl. Cf. Hooker f. 1864—67, Handb. p. 533 und STEPHANI's Abbildung von SINCLAIR's Pflanze (irrtümlich als *A. olivacea* bestimmt) in seinen Icones.

Thysananthus paucidens Steph. 1912, Spec. Hepat. IV : 793 = *Thysananthus polymorphus* Sde Lac.

57. **Thysananthus planus** Sde Lac. 1854, Ned. Kruidk. Arch.

III: 419. Wurde von MITTEN (1871, Fl. vitiensis p. 412) für Viti angegeben, Belegmaterial sah ich nicht. Pflanzen in Samoa (leg. RECHINGER n. 13), welche in STEPHANI's Herbar als *Caudalej. Stephanii* Spr. liegen, gehören aber zweifellos hierher. Von Sunday Isl. habe ich ebenfalls keine Belegstücke gesehen. J a v a, P h i l i p p i n e n, N e u - G u i n e a, S a m o a.

58. **Thysananthus polymorphus** Sde Lac. 1856, Nat. Tijdschr. N. O. I. X: 396. Cf. de Frull. XV sub *Spruceanthus*. S u m a t r a, J a v a, M a l. H a l b i n s e l, B o r n e o, P h i l i p p i n e n, C e l e b e s, N e u G u i n e a, N e u M e c k l e n b u r g, N e u K a l e d o n i e n, B o u g a i n v i l l e, S a m o a, T a h i t i, H a w a i i.

Thysananthus rigidus Steph. 1912, Spec. Hepat. IV : 790 = *Thysananthus Gottschei* (Jack et Steph.) Steph.

Thysananthus scutellatus Hook. f. et Tayl. 1846, Lond. J. of Bot. III: 383 = *Archilejeunea scutellata* (Hk. f. et Tayl.) Steph.

Thysananthus Sinclairii (Mitt.) Steph. 1912, Spec. Hepat. IV · 792 = *Thysananthus fruticosus* (Lindenb. et G.) Schffn.

59. **Thysananthus spathulistipus** (Rw., Bl., Nees) Lindenb. 1845, Syn. Hepat. p. 287. Cf. de Frull. XV. S i k k i m, A s s a m, C e y l o n, A n d a m a n e n, S u m a t r a, B a n g k a, J a v a, M a l. H a l b - i n s e l, B o r n e o, P h i l i p p i n e n, C e l e b e s, S a p a r o e a, C e r a m, N e u G u i n e a, N e u K a l e d o n i e n, N e u e H e b r i - d e n, S a m o a.

Thysananthus virens Aongstr. 1873, Oefv. Vet. Ak. Förh. 1873 no. 5, p. 131 = *Mastigolejeunea humilis* (Gottsche) Spr.

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THE GENUS ALANGIUM IN THE NETHERLANDS INDIES

by

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The present revision comprises, besides the *Alangia* of the Netherlands Indies proper, also those of the Malay Peninsula, North Borneo, and Eastern New Guinea. The materials examined were kindly put at the author's disposal by the Directions of the following herbaria:

B = the Herbarium of the Botanic Garden, Buitenzorg.
BD = the Herbarium of the Botanic Garden, Berlin—Dahlem.
BM = the Herbarium of the British Museum of Natural History, London.
Br = the Herbarium of the Botanic Garden, Brisbane.
E = the Herbarium of the Botanic Garden, Edinburgh.
G = the Herbarium of the University, Groningen.
K = the Herbarium of the Botanic Garden, Kew.
L = the National Herbarium (Rijksherbarium), Leiden.
M = the Herbarium of the Bureau of Science, Manila.
NY = the Herbarium of the Botanic Garden, New York.
S = the Herbarium of the Botanic Garden, Singapore.
Sa = the Herbarium of the Sarawak Museum, Kuching.
U = the Herbarium of the University, Utrecht.
UC = the Herbarium of the University of California, Berkeley.
W = the Herbarium of the Museum of Natural History, Vienna.

Most of the materials were sent to Groningen to be studied there. Moreover, the author had the opportunity to visit the Herbaria of the Botanic Gardens at Kew, that of the British Museum of Natural History at London, and those of LINNAEUS and SMITH preserved among the collections of the Linnean Society at London.

To the Directions of all these Institutes and the Keepers of the Herbaria the author is very thankful for their kind assistance.

Alangium.

Flowers hermaphrodite; calyx tube connate with the ovary, calyx limb free, with 4—10 teeth; petals 4—10, loriformous, valvate, alternating with the calyx-teeth; stamens either isomerous, alternating with the petals

and placed in one whorl, or more, placed in one or more whorls, usually nearly as long as the corolla; anthers linear, with loculi opening laterally and somewhat introrsely; pollen-grains globose; style single, usually nearly as long as the corolla, rarely distinctly shorter; disc intrastaminal, well-developed; ovary 1—2-celled, with one hanging anatropous ovule in each cell, the micropyle directed parallel to the dissepiment, in 2 cells of the same ovary looking in opposite directions. Fruit drupaceous, globose, ellipsoidal or oviformous, often more or less flattened (in the herbarium often strongly flattened and with longitudinal grooves and ribs), crowned by the persistent calyx limb and disc; mesocarp carnose or spongeous; endocarp hard, 1—2-celled with one seed in each cell or with one cell abortive; spermoderm chartaceous or thin-coriaceous; endosperm smooth or slightly grooved; cotyledons foliaceous, flat, palminervous at the base; radicle straight.

Usually trees, more rarely shrubs or woody climbers, the same species sometimes showing different modes of growth. Twigs terete, probably growing nearly horizontally for the greater part in the living state, or even hanging, often slightly dorsiventral. Leaves always alternate (distichous), simple, entire or more rarely lobed or with a small number of large teeth, without stipules; petiole terete or slightly grooved or flattened above, often with articulations at the base and the apex, especially in suckers. Inflorescences axillary, corymbose, all of its branches terminating in flowers. Flowering in the dry season, fruiting in the last part of the dry season and often in the following wet season.

Kara-Angolam & *Angolam* ADANSON, Fam., 2, p. 84 (1763) nomina reicienda; *Angolamia* SCOPOLI, Introd., p. 107 (1777) nom. reic.; *Alangium* LAMARCK, Encycl. méth., bot., 1, p. 174 (1783) nom. conserv.; MIQUEL, Fl. Ind. Bat., I, 1, p. 773 (1856); BENTH. & HOOK.F., Gen. pl., 1, p. 949 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 741 (1879); BOERL., Handl. Fl. Ned. Ind., I, 2, p. 652 (1890); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 260 (1898); KOORD. & VALETON, Bijdr. Booms. Java, 5, p. 66 (1900); WANGERIN, in ENGL., Pflanzenr., IV, 220*b*, p. 6 (1910); RIDL., Fl. Mal. Pen., 1, p. 892 (1922); *Stylidium* LOUREIRO, Fl. cochinch., 1, p. 220 (1790); *Stelanthes* STOKES, Bot. mat. med., 2, p. 339 (1812); *Marlea* ROXB., Hort. beng., p. 28 (1814) nom. nud.; Pl. corom., 3, p. 80, t. 283 (1819); MIQUEL, Fl. Ind. Bat., I, 1, p. 774 (1856); BENTH. & HOOK.F., Gen. pl., 1, p. 949 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 742 (1879); BOERL., Handl. Fl. Ned. Ind., I, 2, p. 653 (1890); KOORD. & VALETON, Bijdr. Booms. Java, 5, p. 70 (1900); *Pautsavia* JUSS., in Mém. Mus. Par., 3, p. 443 (1817); *Stylis*

POIRET, in LAM., Encycl. méth., suppl., 5, p. 260 (1817); *Diacicarpium* BLUME, Bijdr., 13, p. 657 (1825); *Rhytidandra* A. GRAY, in Un. St. Expl. Exped., Bot., 1, p. 302, t. 28 (1854); *Pseudalangium,* F. v. MUELL., Fragm. Phyt. Austr., 2, p. 84 (1860); *Karangolum* KUNTZE, Rev. gen. pl., 1, p. 272 (1891).

About the polymorphy of the genus, especially about the differences that are important for the distinction and the arrangement of the species, the following remarks may be given.

The stems of different species show, in the main, three modes of growth and ramification.

1. The twigs are monopodia, as, at the beginning of each vegetation period, they continue their growth from the terminal bud. In the flowering plant, the ramification takes place by the inflorescences bearing a terminal leaf-bud growing out to a twig later. This we find in *A. salvifolium* ssp. *hexapetalum,* and probably in *A. longiflorum* and *A. hirsutum.*

2. The twigs are sympodia, as the terminal bud of each vegetation period dies and, at the beginning of the following vegetation period, the twig continues its growth from the uppermost axil. The ramification of the twig takes place from the 2 or 3 preceding axils of the same twig. This case we find in *A. chinense, A. rotundifolium* and *A. Kurzii.*

N.B. In *A. nobile* the twigs probably are monopodia, whereas the ramification takes place from few upper axils of the former vegetation period.

3. The twigs are monopodia, continuing their growth, at the beginning of each vegetation period, from the terminal bud. The ramifications, however, originate from the axils of the young leaves of the last vegetation period; each of these ramifications is nearly as strong as the adjacent part of the main twig, this almost causing pseudodichotomy. By this early development of axillary branches the position of the leaves is highly influenced in such a way, that their insertions turn downward; in herbarium specimens, the leaf really bearing a branch in its axil often appears to be placed in the fork between the twig and its branch. Very distinctly we see this in *A. Griffithii, A. villosum* and *A. Warburgianum,* less distinctly in *A. scandens, A. Havilandii, A. Ridleyi* and *A. javanicum.* The latter probably is caused by the later development of the ramifications.

The nervation of the leaves is a valuable character for the distinction of species, but for the natural arrangement of the species it is of little importance. The main nervation varies from purely pennate to purely

palmate, with all kinds of intermediary stages. Real secundary nerves are, in general, restricted to the marginal zone and the basal lobes of cordate leaves, especially in such cases as that of *A. nobile,* where the leaves are at the same time strongly nerved and deeple cordate. Much more peculiar are the arcuate veins, formed by slightly thickened portions of the reticulate venation. The more roundish the lamina, the more arcuate these veins; the more oblong the lamina, the more transverse these veins. (Cfr. Fig. 1*a*, 2*d*, 3*a*, 4*a*, 5*a*.)

The more or less developed asymmetry of the lamina has no greater importance. This asymmetry varies from very strong to nearly none; always the largest side of the lamina is turned towards the tip of the twig.

More important for the natural arrangement of the species is the structure of the inflorescence. This structure is between racemose and cymose. In outline the inflorescence is corymbose; each time that it is branched the number of branches is small and all branches are terminated by a flower. But the branches are not always inserted at the same height, and between them and the terminal flowers there are often 1 or 2 smaller, sterile bracts.

There may be distinguished three main types among them.

1. The first type of inflorescence is sessile or more rarely shortly peduncled; the branches, including the pedicels, are distinctly developed; the sterile bracts as well as the fertile ones are well-developed, and the sterile ones often are removed upward to the bases of the flowers. Instead of the terminal flower of the main axis there is a leaf-bud from which, at the beginning of the next vegetation period, a twig takes its origin. This type of inflorescence we find in *A. salvifolium* ssp. *hexapetalum, A. hirsutum* and *A. longiflorum.* (Cfr. fig. 1*a*.)

2. In the second type of inflorescence the peduncle is always distinct and often rather long, as are the branches and even the pedicels; bracts are often absent and where there occur two branches at the same height there is never more than one bract, and this is turned towards the earth. The smaller sterile bracts are lacking or there is one, or rarely 2, and they are often removed to the bases of the flowers. This type of inflorescence we find in *A. chinense, A. Kurzii, A. rotundifolium, A. scandens, A. Griffithii, A. villosum, A. Warburgianum* and *A. ferrugineum.* (Cfr. fig. 2*d* and 3*a*.)

3. The third type of inflorescence is either sessile with few long primary branches and short secundary and further branches and pedicels, or there is only one main branch so that the inflorescence is rather

long-peduncled. This type of inflorescence occurs in *A. nobile, A. Havilandii, A. Ridleyi* and *A. javanicum*. Bracts are lacking or rare (as in the second type), in *A. nobile* and *A. Havilandii,* or they are well-developed and then often removed to the bases of the flowers, in *A. Ridleyi* and *A. javanicum*. (Cfr. fig. 4*a* and 5*a*.)

The number of stamens is usually the same as that of the petals and calyx teeth; in a small number of species, however, the number of petals is 2—5 × that of the petals and calyx teeth. Among the species occurring in the area dealt with in this publication, *A. salvifolium* ssp. *hexapetalum, A. longiflorum* and *A. hirsutum* belong to this group.

For the distinction of species the form of the filament is rather important. Sometimes the filament can be divided into a thicker or broader lower, and a thinner or narrower upper portion, and in that case the lower portion can even be prolongated before the base of the upper portion and can be hairy in a different way. This difference between a lower and an upper portion is distinct in *A. salvifolium* ssp. *hexapetalum, A nobile, A. Havilandii* and *A. Griffithii* (cfr. fig. 1*c*, 2*m*, 4*c*, 4*f*, 4*h*), less distinct and moreover variable in *A. chinense, A. rotundifolium, A. scandens, A. Kurzii, A. villosum* and *A. ferrugineum*. In the other species it is absent (cfr. fig. 1*f*, 3*l*, 5*c*, 5*k-q*, 5*y-aa*).

Among the floral organs also the form of the style and the stigma is of great importance for the distinction and the arrangement of the species. A part of the species have a rather cylindrical style and a capitate stigma, that is shortly 4-lobed with crenate or superficially divided lobes. This is the case in *A. salvifolium* ssp. *hexapetalum, A. longiflorum, A. hirsutum, A. chinense, A. rotundifolium, A. Kurzii, A. scandens* and *A. Griffithii*. (Cfr. fig. 1*b*, 1*d*, 2*g*.) Another part has a style slightly thickened from the base to the tip, and a stigma deeply split into 2 long and narrow lobes, that are entire and stigmatose at the inside. To this group belong *A. villosum, A. ferrugineum* and *A. Warburgianum*. (Cfr. fig. 3*b*, 3*k*.) A third part have a style thin at the base and gradually thickened towards the apex, and a stigma that is obtuse-conical and with 4 longitudinal stigmatose stripes. This is the case in *A. nobile, A. Havilandii, A. Ridleyi* and *A. javanicum*. (Cfr. fig. 4*b*, 4*g*, 5*b*.)

Of little importance is the fact, that the calyx tube may be grooved or smooth. In general the calyx tube is more or less grooved in *A. salvifolium* ssp. *hexapetalum, A. longiflorum* and *A. hirsutum,* and smooth in all other species, but aberrations from this rule are of no taxonomical

value. The number of grooves, if present, is once or twice that of the calyx teeth.

The endosperm is slightly superficially grooved in *A. salvifolium* ssp. *hexapetalum, A. longiflorum* and *A. hirsutum,* smooth in all other species.

In this paper there have been distinguished, in the genus *Alangium,* 4 sections, 15 species, and in one species 2 subspecies, in 3 others a number of varieties.

It would have been possible to elevate the sections to the rank of genera. In that case we would have got, instead of one sharply limited genus, a number of much less sharply limited smaller ones, of which some even would appear somewhat artificial, and all of them would comprise rather few species. This practice appeared undesirable.

In delimiting the species, the large European (Linnean) species were taken as an example, not the small species of the Austrian botanists (KERNER, WETTSTEIN, and followers). The large Linnean species appear to coincide more or less with the intercrossing communities of which all members may give fertile hybrids (commiscua of DANSER). The small species of the Austrian botanists often are natural subdivisions of the large species. In those cases in which they appear to be distinct geographical variations, they might be distinguished as subspecies. This is certainly the case in *Alangium salvifolium* ssp. *decapetalum* and ssp. *hexapetalum,* perhaps also in the forms united under *Alangium villosum* Such subspecies seem to be species on first sight, but they are connected by intermediary forms.

Under the name of varieties are taken together all variations of a species. Also the subspecies distinguished are varieties, but not all varieties are subspecies. In *Alangium villosum* there have been distinguished varieties that very probably deserve the rank of subspecies. In other cases, as in *A. nobile* and *A. javanicum* the systematic value of the varieties distinguished could not be stated, but they looked too important to be passed by in silence. They may as well appear to be new species as subspecies or only local forms of little taxonomical importance.

First key to the species, for flower-bearing materials.

1 Stigma broader than long, or sometimes as broad as long, capitate or semiglobose, 4-lobed, with crenate lobes 2
Stigma longer than broad, obtuse-conical, with 4 longitudinal stigmatose stripes 11
Stigma deeply split into 2 long and narrow lobes 9

2 Stamens 2—6 × as many as petals 3

Stamens as many as petals 5

3 Flowers 14—23 mm long. Anthers longer than the filaments. Inflorescences 7—17-flowered. Malay Peninsula and whole Malay Archipelago except Borneo **1. A. salvifolium ssp. hexapetalum**, p. 250

Flowers 25—50 mm long. Anthers shorter than the filaments. Inflorescences 1—5-flowered 4

4 Flowers 35—50 mm long. Young twigs and inflorescences and nerves of the leaves below tomentose. Borneo **2. A. longiflorum**, p. 253

Flowers nearly 25 mm long. Young twigs, inflorescences and nerves of the leaves below hirsute-tomentose or hirsute. Borneo, Sumatra? **3. A. hirsutum**, p. 254

5 Leaves palminervous at the base. Connective glabrous or hairy . . 6

Leaves entirely penninervous. Connective hairy. Sumatra, Borneo . . **7. A. scandens**, p. 264

6 Both style and connective glabrous. Pedicels 0—2 mm long. Inflorescences 6—60-flowered. Sumatra to Moluccas and Malay Peninsula **8. A. Griffithii**, p. 266

Either style or connective hairy. Pedicels 5—21 mm long. Inflorescences 3—25-flowered 7

7 Style hairy, connective glabrous. Java, Lesser Sunda Islands . . . **4. A. chinense**, p. 255

Style glabrous, connective hairy 8

8 Lamina roundish to ovate or triangular-ovate, often lobate or with few large teeth, glabrous below or shortly hirsute-tomentose on the nerves, never entirely tomentose. Flowers 7.5—24 mm long. Malay Peninsula, Sumatra, Borneo, Java, Bali **5. A. rotundifolium**, p. 258

Lamina usually triangular-ovate, rarely more roundish or more oblong, never lobate nor dentate, entirely soft-tomentose below. Flowers 19—31 mm long. Malay Peninsula, Sumatra, Java . . . . . **6. A. Kurzii**, p. 262

9 Calyx teeth lingulate, more than 1 mm long. Batjan Islands . . . **11. A. Warburgianum**, p. 273

Calyx teeth short-triangular, less than 1 mm long 10

10 Flowers at most 12 mm long. Java, Flores . . **9. A. villosum**, p. 269

Flowers 15—16 (—22?) mm long. New Guinea . . . . **10. A. ferrugineum**, p. 272

11 Filament composed of a dilate lower and a narrower upper portion. Leaves either entirely penninervous or palminervous at the base . 12

Filament not composed of two different portions. Leaves entirely penninervous 13

12 Leaves palminervous at the base. Calyx teeth 1—3.5 mm long. Indumentum hirsute-tomentose. Malay Peninsula, Sumatra, Borneo **12. A. nobile**, p. 275

Leaves entirely penninervous. Calyx teeth nearly 0.75 mm long. Indumentum very densely thin-tomentose. Borneo . . . . . . **13. A. Havilandii**, p. 277

13 Twigs between the adult leaves 3—9 mm thick. Flowers 18—27 mm

long. Corolla in bud 4—7 mm thick, in herbarium specimens angular. Malay Peninsula, Sumatra . . . . . . **14. A. Ridleyi**, p. 278

Twigs between the adult leaves 1.5—6.5 mm thick. Flowers 8—25 mm long. Corolla in bud 1.75—5 mm thick, nearly terete in herbarium specimens . . . . **15. A. javanicum**, p. 281

The last 2 species can only be distinguished with certainty when fruits are present. Cfr. also *A. maliliense* added afterwards.

Second key to the species, for fruit-bearing materials.

A. Havilandii, the fruit of which is unknown, and *A. maliliense*, added afterwards, have not been inserted in this key.

1 Leaves palminervous or triplinervous at the base 2

Leaves entirely penninervous 9

2 Leaves triplinervous at the base, symmetrical or slightly asymmetrical 3

Leaves 3—11-plinervous at the base, usually strongly asymmetrical, if nearly symmetrical never triplinervous 5

3 Leaves glabrous or sparingly hairy on the nerves beneath near the base. Fruit nearly globose, rarely ovate, with rounded base and apex, 9—18.5 mm long incl. the calyx limb. Malay Peninsula, nearly whole Malay Archipelago with exception of Borneo . . . . . .
1. A. salvifolium ssp. hexapetalum, p. 250

Leaves hirsute or appressedly hairy on the petiole, the midrib above and the nerves and veins below. Fruit ellipsoid or ovate, 17—32.5 mm long 4

4 Leaves shortly appressedly hairy on the petiole, the midrib above and the nerves and veins below. Fruit rounded at the base and the apex, 17—20 mm long including the calyx. Borneo **2. A. longiflorum**, p. 253

Leaves more or less hirsute on the petiole, the midrib above, and the nerves and veins below. Fruit acute at the base and the apex, 28—32.5 mm long inclusive the calyx limb. Borneo, Sumatra?
3. A. hirsutum, p. 254

5 Fruit 26—32 mm long incl. the calyx limb, thickly tomentose. Calyx lobes 2—3 mm long, connivent. Malay Peninsula, Sumatra, Borneo
12. A. nobile, p. 275

Fruit 9—28 mm long incl. the calyx limb, glabrous or thin-tomentose. Calyx teeth hardly visible, not connivent 6

6 Leaves 3—5-plinervous at the base. Petiole 4—12 mm long. Lamina 2 or more times as long as broad. Fruit 12—18 mm long, incl. calyx limb, one-celled, compressed-oviformous. Disc as high as the calyx limb or only little higher. Sumatra to Moluccas incl. the Malay Peninsula . . . . **8. A. Griffithii**, p. 266

Leaves 4—9-plinervous at the base. Petiole 8—65 mm long. Lamina less than twice as long as broad, usually nearly as long as broad. Fruit 9—28 mm long, incl. calyx limb, one- or 2-celled, very rarely 3-celled, ovate or ellipsoid, compressed or not so. Disc usually swollen and distinctly higher than the calyx limb. 7

7 Fruit 17—28 mm long incl. calyx limb, usually one-celled or more rarely 2-celled with one abortive cell, rarely completely 2-celled. Leaves glabrous, sparingly short-hairy, or more or less hirsute-tomentose on the nerves below, but never entirely soft-tomentose below. Malay Peninsula, Sumatra, Borneo, Java, Bali **5. A. rotundifolium**, p. 258

Fruit 9—14 mm long incl. the calyx limb, usually 2-celled. Leaves either nearly glabrous or entirely tomentose below 8

8 Leaves often dentate or lobate, wellnigh glabrous. Fruit 9—13 mm long incl. the calyx limb. Java, Lesser Sunda Islands . . . . **4. A. chinense**, p. 255

Leaves never dentate nor lobate, entirely soft-tomentose below. Fruit 12—14 mm long incl. the calyx limb. Malay Peninsula, Sumatra, Java **6. A. Kurzii**, p. 262

9 Fruit 8—18 mm long incl. calyx limb. Leaves glabrous or tomentose below 10

Fruit 17—37 mm long. Leaves glabrous, sparingly hairy or thin-tomentose on the nerves below 12

Fruit 30—32 (—35?) mm long, leaves soft-hairy with ferrugineous indumentum below. New Guinea . . **10. A. ferrugineum**, p. 272

10 Disc higher than the calyx limb. Fruit ovate with rounded base, somewhat acuminate towards the apex, 11—13 mm long. Sumatra, Borneo **7. A. scandens**, p. 264

Disc not higher than the calyx limb. Fruit not like this 11

11 Calyx teeth oblong, nearly 1.5 mm long, connivent. Fruit 17—18 mm long incl. calyx limb, ovate-ellipsoid, somewhat acute at the base. Batjan Islands . . . . **11. A. Warburgianum**, p. 273

Calyx teeth much shorter, not connivent. Fruit 10—17 mm long incl. calyx limb, nearly globose or ellipsoid, rounded at the base and the apex. Java . . . . **9. A. villosum**, p. 269

12 Fruit 27—37 mm long incl. calyx limb, 18—22 mm broad, 12—14 mm thick, strongly grooved and ribbed in the dry state with 10—14 obtuse ribs. Twigs between the adult leaves 3—9 mm thick. Malay Peninsula, Sumatra . . . . **14. A. Ridleyi**, p. 278

Fruit 17—35 mm long, 11—17.5 mm broad, 6—12 mm thick, usually not or only slightly ribbed. Twigs between the adult leaves 1.5—6.5 mm thick. Malay Peninsula, and from Sumatra to New Guinea with exception of the Lesser Sunda Islands **15. A. javanicum**, p. 281

Section I. *Stamens 2—5 × as many as petals and calyx teeth. Style cylindrical with capitate 4-lobed stigma. Endosperm shallow-grooved. Radicle at least 1.5 × as long as the cotyledons.* Species 1—3. **Fig. 1.** — Stems monopodial, branching from the axils of the former vegetation period, in flowering specimens from the terminal buds of the inflorescences. Leaves symmetrical, usually obovate-oblong, palminervous at the base. Inflorescences sessile or shortly peduncled, with distinct branches, pedicels, and bracts as well at the base of the branches

as between these and the flowers. Style glabrous. Ovary one-celled. Fruit slightly, seed hardly flattened.

1. **Alangium salvifolium** (LINN.F.) WANGERIN **ssp. hexapetalum** (LAM.) WANGERIN — *Internodes* between the adult leaves 1.3—4.5 cm long, 1.5—5 mm thick, glabrescent. *Petiole* 5—15 mm long, glabrescent; lamina usually obovate-oblong to oblong, more rarely broader or narrower, symmetrical, 7.5—18.5 cm long, 3—9 cm broad, rounded to cuneate at the base, rather long- and abrupt-acuminate towards the usually obtuse apex, thin-coriaceous, glabrous or sparingly hairy on the

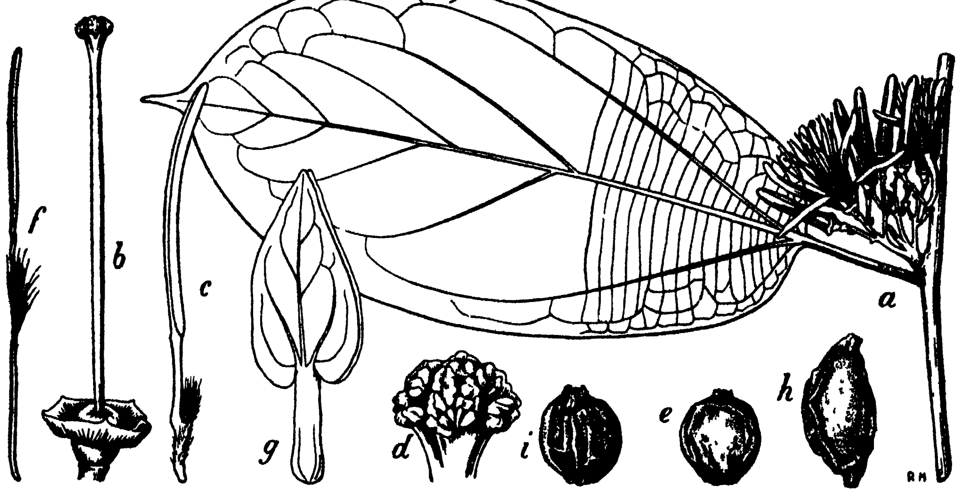

Fig. 1: *Alangium* sect. I. **a—e**: *A. salvifolium* ssp. *hexapetalum*; **a**: twig fragment with leaf and inflorescence, $^3/_5$ ×; **b**: calyx and pistill, $2^1/_2$ ×; **c**: stamen, $2^1/_2$ ×; **d**: stigma, $7^1/_2$ ×; **e**: fruit, $^3/_5$ ×; **f—h**: *A. hirsutum*; **f**: stamen, $2^1/_2$ ×; **g**: embryo, $2^1/_2$ ×; **h**: fruit, $^3/_5$ ×; **i**: *A. longiflorum*, fruit $^3/_5$ ×; **a, b, d**, after Bot. Gard. Buitenzorg XVII. C. 136, **c** after VAN STEENIS 909, **e** after TEYSMANN s.n. from P. Sebesi, **f, g, h** after HALLIER B. 3238, **i** after ELMER 16120.

nerves below, triplinervous at the base, moreover with 3—6 lateral nerves at each side of the midrib. *Inflorescence* shortly and densely hirsute-tomentose, sessile or nearly sessile, 2—3 × branched, 3—17-flowered, 12—23 mm long (flowers excluded); peduncle 2—4 mm long, pedicels 2—8 mm long; bracts triangular 0.5—3 mm long, 0.5—0.75 mm broad. *Flowers* 14.5—23 mm long; calyx shortly and densely hirsute-tomentose, the tube 0.75—1.75 mm long, the limb cupuliformous or spreading, 0.75—1.75 mm long, 2.5—4.25 mm wide, with teeth 0.25—0.5 mm long; corolla 5—7-, usually 5-merous, in the bud state nearly cylindrical 1.75—2.75 mm thick, swollen up to 4.5 mm thick in the

basal part, slightly swollen in the apical portion, obtuse at the apex; petals 14—21 mm long, short-tomentose outside, shortly hairy inside above the dilate basal portion; stamens 10—18 in number, 12—18 mm long; filament 5—6 mm long, the basal part 4—5 mm long, 1—2.5 mm broad, thickened prolongated and bearded at the apex inside, pilose along the margin and outside, the upper portion 1—2.5 mm long, 0.75 mm broad, glabrous; anther 8—13 mm long, 0.75 mm broad, with glabrous connective; style glabrous, 11—18 mm long, 0.5—0.75 mm thick; stigma capitate, 1 mm long, 2.25 mm in diameter; disc 5—7-angular, 1.5 mm high, 4 mm in diameter; ovary one-celled. *Fruit* in the dry state globose to oviformous-globose, rounded at the base and the apex, 9—18.5 mm long (inclusive calyx and disc), 6.5—16 mm diam., short-tomentose to glabrous, sometimes with 10—14 obtuse ribs, crowned by the calyx limb 1 mm high, 4 mm wide and the disc as high as the calyx or little higher. (Description after the herbarium materials mentioned). **Cfr. fig. 1, a—e.**

According to the notes on herbarium labels *A. salvifolium* ssp. *hexapetalum* is mostly a climbing shrub up to 26 m high with a stem up to 10 cm thick, more rarely an erect shrub or a small tree up to 12 m high with a bole up to 30 cm thick; its leaves are glossy green, not deciduous in the dry season; its corolla is white or greenish-white, or green inside, rarely red, the stamens white, the fruit red when ripe. It occurs at an elevation of 10—1400 m above sea level.

Alangium hexapetalum LAMARCK, Enc. méth., bot., 1, p. 175 (1783); D. C., Prodr., 3, p. 203 (1828); MIQ., Fl. Ind. Bat., I, 1, p. 774 (1856); TEYSM. & BINN., Cat. Pl. Hort. Bot. Bogor., p. 238 (1866); GRESH., Meded. 's Lands Plantent., 25, p. 89 (1898); KOORDERS, Exkursionsfl. Java. 2, p. 731 (1912); *Alangium frutescens* ZOLLING., Syst. Verz. 1842—1848, fasc. 3, p. 63 (1855); in Nat. Tijdschr. Ned. Ind., 14, p. 156 (1857) nomen; *Alangium Mohillae* TUL., Ann. Sc. Nat. ser. 4, 6, p. 105 (1856); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 261 (1898); *Alangium glandulosum* THWAITES, Enum., p. 133 (1859); TRIMEN, Handb. Fl. Ceyl., 2, p. 286 (1894); *Alangium Lamarckii* THWAITES, Enum. Pl. Zeyl., p. 133 (1859) p. p.; CLARKE, in Hook.f., Fl. Br. Ind., 2, p. 741 (1879) p. p. incl. var. *glandulosum*; TRIMEN, Handb. Fl. Ceyl., 2, p. 285 (1894) p.p.; KING, Journ. As. Soc. Beng., 71, II, p. 76 (1902) cum var. *glandulosa*; WANGERIN, in ENGL., Jahrb., 38, Beibl. 86, p. 62—67 (1906) p.p.; RIDL., Fl. Mal. Pen., 1, p. 892 (1922); *Alangium sundanum* MIQ., Fl. Ind. Bat., I, 1, p. 774 (1856); suppl. Sum., p. 136, 341 (1860) cum var. β; TEYSM. & BINN., Cat. Pl. Hort. Bot. Bogor., p. 238 (1866); KURZ, For. Fl. Burma, 1, p. 543 (1877); GRESH., Meded. 's Lands Plantent., 25, p. 90 (1898) prob.; KOORD. & VALET., Bijdr. Booms. Java, 5, p. 68 (1900); JANSSON., in MOLL & JANSS., Mikrogr. 3, p. 695 (1918); *Karangolum Mohillae* KUNTZE, Rev. gen. pl., 1, p. 273 (1891); *Alangium salvifolium* KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 103 (1912); BAKER, in Journ. Bot., 62, suppl. p. 45 (1924) p.p.; DAKKUS, in Bull. Jard. Bot. Buitenz., ser. 3, suppl. 1, p. 13 (1930); *Alangium salviifolium* ssp. *hexapetalum* WANGERIN, in

ENGL., Pflanzenr., IV, 220b, p. 9, ic. 2F (1910) p.p.; KOORD., Exkursionsfl. Java, 2, p. 732 (1912); MELCHIOR & MANSF., in ENGL., Jahrb., 60, p. 163 (1925); DOCT. v. LEEUWEN, Zoocec., p. 438 (1926); VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. 3, 12, p. 173 (1932).

As to the synonymy I will remark that I have not seen the originals of LAMARCK's species, but that I have followed the British-Indian florists in the interpretation of the name *A. hexapetalum*. Yet it was not possible to decide, in each separate case, what plant exactly these botanists meant by *A. hexapetalum* and *A. decapetalum*. The type of *A. salvifolium* (*Grewia salvifolia* LINN.F.) I saw in SMITH's herbarium at London.

MALAY PENINSULA. Perak: SCORTECHINI s.n. (L); Larut, 90—150 m el., KING's coll. 5590 (B, BD, BM, K); Singapore: Changi, RIDLEY 6020 coll. MAT (BM, S); Sungei Jurong, RIDLEY 6775 (S).

SIMEULOEË. ACHMAD 339 (B, K, L, S), v.n.: *sikilir silai*.

SUMATRA. Palembang, Soekaradja, R. Roepit, 240 m alt., FORBES 2984 (BM); G. Dempo, 1400 m alt., AJOEB (Exp. JACOBSON) 445 (B); Lampongs, cultivated in the Buitenzorg Botanic Garden, under XVII. C. 135 (B), probably from fruit of the following: Tjanti, TEYSMANN 4251 H.B. (B, K, L, U, originals of *Alangium sundanum* MIQ. var. β).

POELOE SEBESI. TEYSMANN 4473 H.B. (B, L, U, in the latter originals of *Alangium sundanum* MIQ.), v.n.: *wait sesatak*.

ANAMBAS ISLANDS. Siantan, near Terempa, 60—90 m alt., HENDERSON 20197 (B, S); east of Terempa, 250 m alt., VAN STEENIS 909 (B, S).

JAVA. Without exact locality: cultivated in the Buitenzorg Botanic Garden under XVII. C. 136 & 136a (B); TEYSMANN s.n. (L); TEYSMANN & DE VRIESE s.n. (L); DE VRIESE s.n. (L); „Bonserang", coll.? s.n. (L); Oedjong Genteng near Djampang Koelon, 1 m el., BACKER 17546 (B); between Weltevreden and Mr. Cornelis, Salemba, in a garden, 20 m alt., BACKER 32021 (B); Buitenzorg, Tjikeumeuh, 250 m alt., BUSSE 1489a (BD); south of Weleri, 300 m alt., BACKER 16604 (B); Ngarengan (Djapara), 50 m alt., KOORDERS 33654 β (B); for. no. 2456*, herb. no. 35114 β (B, L); for. no. 2456bis*, herb. no. 33587 β (B); Tjabak, Blora (Rembang), KOORDERS 40406 β (B); Soerabaja, HORSFIELD s.n. (U, from this locality probably also in BM, K, L, originals of *Alangium sundanum* MIQ.); Malang, HORSFIELD s.n. (K); Lamadjang Tenga, ZOLLINGER 2289 (B, BD, BM, K) type no. of *Alangium frutescens* ZOLL., „corolla flavescente-albida, odorifera, frutex subsarmentosa"; Djember, 100 m alt., BACKER 17764 (B); Poeger Watangan, 10 m alt., KOORDERS for. no. 1249*. herb. no. 21321 β (B, BD, L); Tjoeramanis, KOORDERS 38488 β (B, L); Ragadjampi Balak, Kedoenen (Banjoewangi), KOORDERS for. no. 1152*, herb. no. 29098 β (B), v.n.: *lantoro*; Bama (Bomo), near Kedoenen, KOORDERS for. no. 1409*, herb. no. 29125 β (B, BD, K, L), v.n.: *lantoro*; Bama, TEYSMANN s.n. (B, L, the former authentic specimen of „*Alangium frutescens* Z. & M.").

KANGEAN ISLANDS. Cultivated in the Buitenzorg Botanic Garden under III. G. 60 & 60a (B), and IX. A. 22a (B), from Kangean; Kangean, Doekoh, DOMMERS 82 (B), v.n. *topo topo boerih*, and DOMMERS 216 (B), v.n.: *kantjiloed*.

BALI. G. Goendoel, VAN DER PAARDT 66 (B), v.n.: *melati*.

SOEMBAWA. Between Boeër and Alas („Bner & Allas"), ZOLLINGER 3391 Z.M. (B, BM).

SOEMBA. TEYSMANN s.n. (B, L), v.n.: *kemali wateh*.

SELEBES. Paré-paré, Kp. Sapagaloeng, NOERKAS (Exp. VAN VUUREN) 287 (B,

L); Pangkadjéne, TEYSMANN 11849 (B, L), 11894 (B, L), 12117 (B, L), 12436 (B, L).

SALAJAR. TEYSMANN 13832 H.B. (B, L).

NEW GUINEA. Probably near the Triton Bay, ZIPPELIUS 197c (B, L).

Moreover cultivated in the Buitenzorg Botanic Garden, of unknown provenance, under XII. B. 207 & 207a (B, L, U), XII. B. 210a (B), and XVII. C. 133a (B).

Further distribution: Comores, W. & S. coast of India, Ceylon, Andamans, Philippines (?).

2. **Alangium longiflorum** MERRILL — *Internodes* between the adult leaves 1.8—5.2 cm long, 1—4 mm thick, tomentose. *Petiole* 8—12 mm long, tomentose; lamina obovate-oblong or somewhat broader or narrower, slightly asymmetrical, 5.5—18 cm long, 3—8.5 cm long, 3—8.5 cm broad, with the base rounded to cuneate at the broad side, usually cuneate at the narrow side, rather long-acuminate towards the obtuse apex, chartaceous, triplinervous at the base, moreover with 5—7 lateral nerves on each side of the midrib, on the upper side only the midrib and the strong lateral nerves shortly appressedly hairy, on the underside moreover all lateral nerves. *Inflorescence* tomentose, once or twice branched, 1—5-flowered, 3—7 mm long (the flowers excluded), sessile or nearly so, the peduncle 0—1.5 mm long, the pedicels 2—6 mm long; bracts triangular, 0.75—1 mm long, 1 mm broad. *Flower* 30—50 mm long; calyx tomentose, the tube campanulate-infundibuliformous, 1—2 mm long, the limb infundibuliformous to cupuliformous, 1—1.5 mm long, 2.5—3 mm wide, with teeth 0.25—0.5 mm long; corolla usually 5-merous, subcylindrical in the bud state, hardly swollen in the basal portion, somewhat swollen in the upper one-third part, up to 3—4 mm thick, often shortly abruptly acuminate towards the obtuse tip; petals 34—49 mm long, thin- but dense-tomentose outside, sparingly shortly appressedly pilose at the inside except in the basal 5 mm; stamens 2—6 × as many as petals, 33—48 mm long; filament filiformous, 27—40 mm long, 0.2—0.5 mm thick, from 6 to 11 m above the base long-pilose; anther 6—8 mm long, acute at the base and the tip, with glabrous connective; style glabrous, 31—46 mm long, 0.3—0.4 mm thick; stigma capitate, 1 mm long, 1.25—1.5 mm in diameter; disc 0.5 mm high, 1.25—1.5 mm in diameter; ovary one-celled. *Fruit* in the dry state ellipsoidal or oviformous, rounded at the base and the apex, 17—20 mm long (incl. the calyx), 14—16 mm broad, 10—12.5 mm thick, glabrous or thin-tomentose, sometimes sulcate and with 10—12 ribs, crowned by the calyx limb 1—1.5 mm long, 3.25—3.5 mm wide, and the somewhat shorter disc. (Description after the Borneo specimen and Philippine materials from Luzon, Negros, Samar, Mindanao and Tawi-tawi). **Cfr. fig. 1, i.**

Alangium longiflorum MERRILL, in Phil. Journ. Sc., bot., 7, p. 319 (1912); Enum. Phil. Fl. Pl., 3, p. 240 (1923); QUISUMBING, in Philipp. Agric., 13, p. 441, t. 1 (1925).

BORNEO. Mt. Kinabalu, Penibukan, 1200 m el., CLEMENS 30527 (B, NY), tree 15 m high, 25 cm diam.; Sarawak, Kuching, KALONG (HAVILAND) 1505 (K, Sa), small tree, petals white.

Distribution: Philippine Islands.

3. **Alangium hirsutum** BLOEMBERGEN, n. sp. — *Internodia* inter folia adulta 6—26 mm longa 2—4.5 mm crassa, statu juvenili hirsuto-tomentosa postea hirsuta, denique glabrescentia. *Petiolus* 4—9 mm longus, hirsuto-tomentosus; lamina plerumque obovato-oblonga, subsymmetrica, 3.6—13.5 cm longa, 1.5—5.75 cm lata, basi rotundata, apicem acutum vel obtusum versus subabrupte breviuscule acuminata, chartacea, facie superiore costa tantum hirsuta, facie inferiore etiam nervis venisque hirsutis, basi vix triplinervi, nervis lateralibus 7—10 utrinque. *Inflorescentia* hirsuto-tomentosa, 1—2-flora, sessilis, pedicellis c. 0.5 mm longis; bracteae triangulares, 0.75—1 mm longae 1 mm latae. *Flos* c. 25 mm longus; calyx dense hirsuto-tomentosus; tubus campanulatus 2 mm longus, limbus infundibuli-cupuliformis, 1.2 mm longus, 3.5 mm latus, dentibus 0.5 mm longis; corolla 5—7-meres, petalis c. 22.5 mm longis, facie exteriore parce breviterque pilosis, facie interiore a 6 mm usque ad 8 mm supra basin magis pilosis, ceterum parce breviterque pilosis; stamina c. 15, 20—21 mm longa; filamentum 12—13 mm longum, filiforme, 0.1—0.25 mm crassum, parte basali 6—10 mm longa excepta pilosum; anthera 8—9 mm longa, basi apiceque acuta, connectivo glabro; stylus glaber 22 mm longus, c. 0.3 mm crassus; stigma capitatum vel semiglobosum, 0.7 mm longum, 1 mm diametro; discus 0.5 mm altus 1 mm diametro; ovarium uniloculare. *Fructus* in herbario ellipsoides vel oviformis, basi apiceque acutus, 28 -32.5 mm longus (calyce incluso), 13—15 mm latus, 12—13 mm crassus, tenuiter tomentosus vel glaber, nonnunquam sulcis c. 6 levibus vel profundioribus, limbo calycis c. 1.5 mm longo 2.5—3 mm lato et disco minus alto coronatus. (Description after the Borneo materials). **Cfr. fig. 1, f—h.**

A. hirsutum is closely allied to *A. longiflorum* and *A. brachyanthum* MERR., less closely to *A. salvifolium*. From *A. longiflorum* it differs by shorter flowers and more hirsute indumentum, from *A. brachyanthum* by longer flowers, whereas the leaves of the latter species are not known with certainty and the fruit quite unknown. From *A. salvifolium* our species differs by filaments without thickened basal portion.

The Sumatra specimen, not taken up in the description, is only fruit-bearing and differs from the Borneo plant by the less hirsute indumentum and the fruit only 22 mm long.

Borneo. Western Part, Amai Ambit, Hallier B. 3238 (B, type, L).
Perhaps also:
Sumatra. Palembang, Boschpr. T. 52 (B, L).

Section II. *Stamens as many as petals and calyx teeth. Style cylindrical with capitate 4-lobed stigma. Endosperm smooth. Radicle shorter than half the length of the cotyledons.* Species ~~4~~—8. **Fig. 2.** — Stems either sympodial, branching from the axils of the former

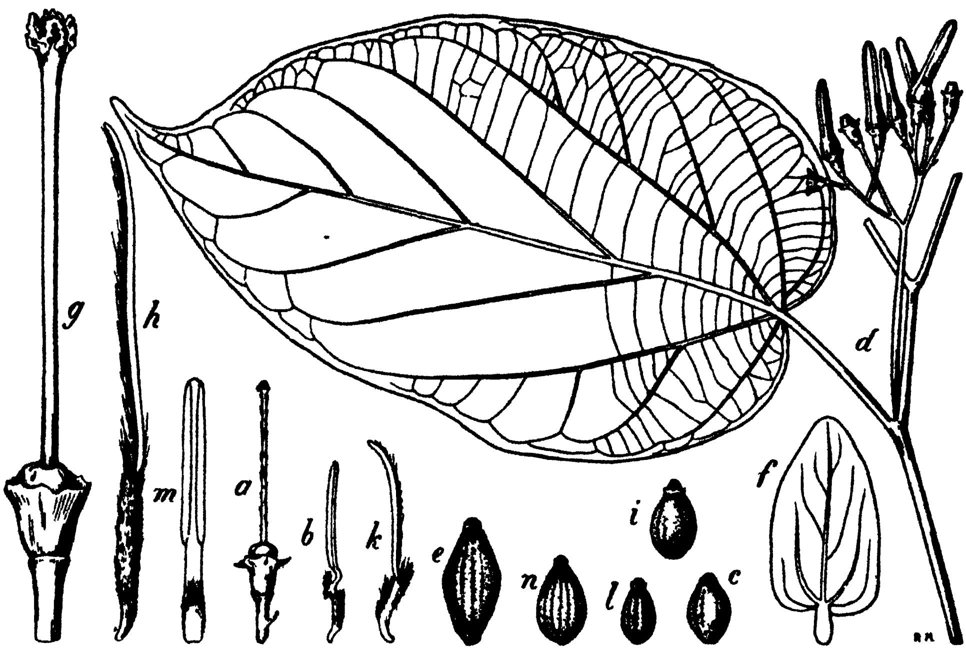

Fig. 2: *Alangium* sect. II **a—c**: *A. chinense*; **a**: calyx with pistill, 2½ ×; **b**: stamen, $2^1/_2$ ×; **c**: fruit, $^3/_5$ ×; **d—f**: *A. rotundifolium*; **d**: twig fragment with leaf and inflorescence, $^3/_5$ ×; **e**: fruit, $^3/_5$ ×; **f**: embryo, $2^1/_2$ ×; **g—i**: *A. Kurzii*; **g**: calyx with pistill, $2^1/_2$ ×; **h**: stamen, $2^1/_2$ ×; **i**: fruit, $^3/_5$ ×; **k—l**: *A. scandens*, **k**: stamen, $2^1/_2$ ×; **l**: fruit, $^3/_5$ ×; **m—n**: *A. Griffithii*; **m**: stamen, $2^1/_2$ ×; **n**: fruit, $^3/_5$ ×; **a, b,** after Lörzing 640, **c** after Koorders 30232β, **d** after Winckel 1570β, **e, f,** after Fox 122, **g, h, i,** after Lörzing 8960, **k** after Endert 4076, **l** after Endert 4052, **m** after Lambach 2720, **n** after Forbes 2739.

vegetation period (species 4—6), or monopodial and branching from the axils of the last vegetation period (species 7—8). Leaves usually asymmetrical, nearly ovate-cordate, usually palminervous at the base, rarely entirely penninervous (spec. 7). Inflorescences with distinct peduncle, branches and pedicels, but the bracts little developed. Style glabrous or hairy. Ovary 1—2-celled. Fruit and seed flattened.

4. Alangium chinense (Loureiro) **Rehder** — *Internodes* between

the adult leaves 2—8 cm long, 2—4.5 mm thick, glabrous or somewhat appressedly short-hairy, especially near the insertion of the leaves. *Petiole* 16—60 mm long, appressedly hairy or glabrescent; lamina roundly- or triangular-ovate in outline, 5—28 cm long, 3—27.5 cm broad, often with a number of large acuminate teeth or lobes, asymmetrical, more or less obliquely cordate, usually cuneate at the narrow side, rather long and abruptly acuminate towards the acute or subobtuse apex, chartaceous, nearly glabrous at both sides or more or less shortly appressedly hairy on the nerves below, usually 5—9-plinervous, moreover with 3—6 lateral nerves at each side of the midrib. *Inflorescence* sparingly shortly appressedly hairy, 1—4 × branched, 3—23-flowered, 2.2—8.5 cm long (excl. the flowers), the peduncle 1—4.5 cm long, the pedicels 5—22 mm long, bracts linear or filiformous, 0.75—5 mm long, 0.1—0.5 mm broad. *Flowers* 9—18.2 mm long; calyx densely appressedly hairy, the tube campanulate to infundibuliformous, 1—2 mm long, the limb spreading or cupuliformous, 0.5—1 mm long, 1.5—4 mm wide, with teeth 0.25—0.5 mm long; corolla 6—8- usually 7-merous, in bud subcylindrical somewhat swollen above the base, 1.5—4.5 mm thick, obtuse at the apex; petals 8—16.2 mm long, sparingly and appressedly short-hairy outside, glabrous or with few hairs little above the base; stamens as many as petals, 7.5—15.2 mm long; filament 2.5—5.75 mm long, with a lower portion 2—5 mm long, 1—1.2 mm broad, thickened and bearded at the apex inside, moreover pilose at the outside and the margins, and an upper portion 0.5—0.75 mm long, glabrous; anther 5—10 mm long, connective glabrous; style 7—15 mm long, nearly 0.5—0.75 mm thick, pilose on longitudinal stripes; stigma capitate, 1 mm long, 1.2—1.6 mm thick; disc semiglobose, slightly angular, 0.9—1.75 mm high, 2—2.25 mm in diameter; ovary 2-celled. *Fruit* 2-locular, 2-seeded, in the herbarium oviformous or ellipsoidal, rounded or somewhat acute at the base, more acute at the apex, 9—13 mm long (incl. the calyx limb), 6—7 mm broad and thick, sometimes sparingly short-hairy, sometimes superficially ribbed and grooved, crowned by the calyx limb 0.75 mm long 2.5 mm wide, and the exserted 1.5—2 mm high disc (Description after the materials mentioned below). **Cfr. fig. 2, a—c.**

According to notes on herbarium labels *A. chinense* is a shrub or tree, up to 12 m high or even higher, with a bole up to 8 cm thick or even thicker; the flowers are fragrant, the corolla, filaments and style white, the anthers yellow, the ripe fruit dark violet. It occurs from 20 to 1400 m above sea level and flowers in very different times of the year.

Stylidium chinense LOUREIRO, Fl. cochinchin., 1, p. 221 (1790); *Stelanthes solitarius* STOKES, Bot. Mat. Med., 2, p. 339 (1812); *Marlea begoniaefolia* ROXB., Hort. Beng., p. 28 (1814) nom. nud.; Pl. corom., 3, p. 80, t. 283 (1819); DC., Prodr., 4, p. 267 (1830); ROXB., Fl. ind., ed. 2, 2, p. 261 (1832); GRIFFITH, Ic. pl. as., 1, t. 45, 2 (1847); 4,t. 639 (1854); MIQ., Fl. Ind. Bat., I, 1, p. 774 (1856); BENTH., Fl. hongk., p. 138 (1861) p.p.; KURZ, Journ. As. Soc. Beng., 40, II, p. 61 (1871); ROXB., Fl. ind., ed. 3, p. 326 (1874); BRANDIS, For. fl., p. 251 (1874); KURZ, For. fl. Burma, 1, p. 544 (1874); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 743 (1879) p.p.; KOORD. & VALET., Bijdr. Booms. Java, 5, p. 82 (1900) cum var. *palmatidentata*; GAMBLE, Man. Ind. timb., ed. 2, p. 389 (1902) saltem p.p.; BRANDIS, Ind. trees, p. 355 (1906) saltem p.p.; JANSSONIUS, in MOLL & JANSS., Mikrogr., 3, p. 719 (1918); *Stylis chinensis* POIRET, in LAM., Enc. méth., bot., suppl. 5, p. 260 (1817); *Marlea affinis* DECAISNE, in JACQUEM., Voyage Ind., 4, bot., p. 74, t. 83 (1844); SCHNIZL., Iconogr.., 4, t. 262, ic. 1—14 (1849); *Alangium cordifolium* ZOLLING., Syst. Verz. 1842—1848, fasc. 3, p. 63 (1855); *Marlea virgata* ZOLLING., Nat. Tijdschr. Ned. Ind., 14, p. 157 (1857); *Alangium begoniaefolium* BAILL., Hist. pl., 6, p 270 (1877) prob., excl. ic. 249—252; HARMS, in ENGL. & PRANTL, Nat. Pflanzenfam., III, 8, p. 261 (1898) saltem p.p.; WANGERIN, in ENGL., Jahrb., 38, Beibl. 86, p. 61—68 (1906) saltem p.p.; KOORDERS, Exkursionsfl., 2, p. 731 (1912); HALLIER, in ELBERT, Sunda-Exp., 2, p. 285 (1912); KOORD. & VALETON, Atlas, 1, t. 187 (1913); HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3, p. 402 (1917); ed. 2, 2, p. 1217 (1927) excl. var. *tomentoso*; BRUGGEM., Bull. Jard. Bot. Buitenz., ser. 3, 9, p. 204, 216 (1927) ?; *Karangolum chinense* KUNTZE, Rev. gen. pl., 1, p. 273 (1891); *Alangium begoniifolium* ssp. *eubegoniifolium* WANGERIN, in ENGL., Pflanzenr., IV, 220b, p. 20 (1910); KOORD., Exkursionsfl., 2, p. 733 (1912); KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 100 (1912); *Marlea chinensis* DRUCE, Rep. Exch. Cl. Brit, Isl., 1916, suppl. 2, p. 634 (1917); *Alangium chinense* REHDER, in SARGENT, Pl. Wilson., 2, p. 552 (1916) p.p.; MERRILL, En. Phil. Fl. Pl., 3, p. 240 (1923) excl. ssp. *tomentoso*; EVRARD, in LEC., Fl. Indo-Ch., 2, p. 1187, ic. 142, 143, 1—2 (1923) p.p.; MELCHIOR. Notizbl. Bot. Gart. Berl.-Dahlem, 10, p. 825 (1929) excl. var. *tomentoso*; CRAIB, Fl. Siam. Enum., 1, p. 805 (1931).

As to the synonymy of this species I may remark that of *Stylidium chinense* LOUREIRO I saw an original in the Herbarium of the British Museum at London.

From *A. chinense* I keep *A. rotundifolium* and *A. Kurzii* apart as separate species, for the argumentation of which cfr. *A. rotundifolium*.

A. chinense, as accepted here, is rather uniformous in the area dealt with. Some youth forms (either young plants or suckers from old roots) are strikingly different by thicker twigs with longer internodes, more scarce indumentum soon falling off, larger leaf blades (up to 28 cm long and broad) that are more often toothed or lobed, less asymmetrical and with thinner texture, and longer petioles; forms comprised by KOORDERS & VALETON in their var. *palmatidentata*, with more deeply regularly and constantly lobate leaves, are not youth forms, but appear to be too little important to be distinguished as a variety.

JAVA. Without exact locality: BLUME (?) s.n. (L); JUNGHUHN s.n. (K); WARBURG 4671 (BD); G. Tjitjajoer near Pangentjongan, KOORDERS 1303β (B, L); Tjibodas, N 2 (B); Temanggoeng (Kedoe), 600 m el., LÖRZING 640 (B, BD), v.n.: *woeroe pas*; teak-forest Karangasem, north of Wirosari (Semarang), 200 m el., KOORDERS 868β (B, K, L), 869β (B); forestry Telawah (Semarang), tree no. Tl. 220, VINCENT 4671 (B, L), v.n.: *timangan*; G. Kidoel, between Djepitoe & Kala (Soerakarta), 200 m el., BACKER 2829 (B); Pandan (Madioen), 400—900 m el., ELBERT

478 (L); Prigi (Kediri), TEYSMANN s.n. (L, U); Wanasalim, „M. Brubu", 450 m el., ZOLLINGER 2292 (B, BD, BM, K), type number of *Alangium cordifolium* ZOLL.; G. Kawi, WARBURG 4672 (BD); Soerabaja, HORSFIELD s.n. (BM, K), v.n.: *gedreg, opas-opasan*; G. Tengger, Lawang, MOUSSET 264 (B), 1923 (B, L), shade tree in coffee plantations; Wanakerta, S.W. of Gondanglegi, 500 m el., BACKER 3529 (B); the collector asking the name to 10 Javanese passing by, got the following answers: *ègrèk* 1 ×, *kladjang* 1 ×, *mangar* 2 ×, *paron* 1 ×, *tètè* 1 ×, *tibò* 1 ×, *timò* 2 ×, whereas one did not know a name; forest Djenggolo near pasanggrahan Kaliparé, 300 m el., KOORDERS for. no. 2917*, herb. no. 23676β (B); G. Tengger, 1200 m, BUYSMAN s.n. (B, U); Djatirata, 20 m el., BACKER 7975 (B); Poeger, KOORDERS, for. no. 1837*, herb. no. 30232β (B, L), v.n.: *goprak*; Tjoeramanis near Simpolan (Besoeki), 500 m el., KOORDERS for. no. 2167*, herb. no. 20934β (B); Idjen-plateau, forest Simpol, 1150 m el., KOORDERS for. no. 26*, herb. no. 14384β (B, L), v.n.: *opas-opasan*; Idjen, Kendeng, kloof Katjèp, 1500 m el., CLASON 989 (B, G); G. Kemiri Sanga, near Djember, 150 m el., BACKER 30578 (B); G. Idjen, western slope, 1000 m el., BACKER 25396 (B); Idjen-plateau, near Belawan, 1000 m el., BACKER 25231 (B); Banjoewangi, BLUME s.n. (L), v.n.: *upas-upassan*.

BALI, between Boelèlèng and Gitgit, TEYSMANN 2745 H.B. (B, L, U), v.n.. *lengoeng*.

SOEMBAWA. Donggo Mts., K. Mange, 300 m el., WARBURG 17093 (BD), v.n.: *sanga*; with 2 labels: „Sumbawa, 4000', WARBURG 17094 v.n.: *padati*, Strauch", and „Sumbawa, Donggo Geb., K. Kenante, 1200', WARBURG s.n., v.n.: *sanga*, Baum" (BD); Bima, Mata, COLFS 180 (L), v.n.: *kailon gadong*; G. Poesoe, W. of Batoelantèh, 700—900 m el., ELBERT 4153 (L); G. Batoelantèh, N. slope, 800—1400 m el., ELBERT 4179 (L).

SOEMBA. Taboendoeng, TEYSMANN 8957 H.B. (B); G. Harara, 560 m el., BOSCHPR.BB. 5414 (B), v.n.: *kambah*.

FLORES. Wai Sano (W. Flores), 650 m el., DE JONG 38 (B).

Further distribution: Tropical Africa, southeastern Asia from British India and China to the Philippines and southwards.

5. **Alangium rotundifolium** (HASSKARL) BLOEMBERGEN n. comb. — *Internodes* between the adult leaves 1.2—7 cm long, 2—6.5 mm thick, in the young state with traces of a woolly tomentum. *Petiole* 7—55 mm long, 1—2 mm thick, hairy like the twig; lamina roundish to ovate or triangular-ovate, sometimes with few large teeth or lobes at each side, asymmetrical, 5.5—22 cm long, 3.5—18 cm broad, rounded to cordate at the base, often cuneate at the narrow side, rather long and often abruptly acuminate towards the acute or obtuse apex, chartaceous to thin-coriaceous, sparingly short-hairy on the nerves, very sparingly between the nerves above, slightly woolly hairy to hirsute on and between the nerves below, rarely entirely glabrous or more woolly tomentose on the whole lower surface (but never soft-tomentose), 5—7-plinervous at the base, moreover with 4—7 lateral nerves on each side of the midrib. *Inflorescence* thin-tomentose or more glabrous, 3—4 × branched, 2—13-flowered, 12—52 mm long (flowers excluded); peduncle 6—35 mm long,

pedicels 6—15 mm long; bracts filiformous to triangular, 0.5—2.5 mm long, 0.5 mm broad, *Flowers* 7.5—24 mm long; calyx tomentose, tube infundibuliformous to cylindrical, 1—3 mm long, limb spreading, 1 mm long, 3.5—3.75 mm in diameter, with teeth 0.25—0.5 mm long; corolla 6—9- usually 7-merous, in bud subcylindrical 1.75—3 mm thick, swollen and up to 4 or 5 mm thick above the base, slightly swollen at three-quarters of the length, obtuse at the tip; petals 6.5—21 mm long, thin-tomentose to nearly glabrous outside, long-pilose at the inside in the lower dilate part, along the margins and at the apex; stamens as many as petals, 6—19.75 mm long, filament 0.75—7.5 mm long, with a lower part 0.75—5.5 mm long 0.5—3.5 mm broad broadest in the middle and not thickened at the apex, pilose outside and along the margins inside, and an upper part 0.4—1.5 mm long 0.3—0.5 mm broad, long-hairy at the inside; anther 5—12.25 mm long, 0.75—1 mm broad, with a connective long-pilose inside up to the tip; style glabrous, 6—15 mm long, nearly 0.3 mm—0.7 mm thick; stigma capitate, 1.25 mm long, 1.5 mm thick; disc truncate-conical, 0.5—2 mm high, 1.5—1.75 mm in diameter, with 6—9 longitudinal grooves; ovary usually one-celled, rarely 2-celled with unequal cells. *Fruit* usually one-celled and one-seeded, rarely with a second little-developed cell, ovate-oblong-ellipsoidal in the dry state, often flattened, cuneate or rounded at the base, acute at the apex, 16—28 mm long (incl. the calyx), 7—11 mm broad, 5—8 mm thick, glabrous or thin-tomentose, sometimes slightly grooved, crowned by the spreading calyx limb 1—1.5 mm long 3.5—4 mm in diameter, and the exserted disc 2 mm high. (Description after the materials enumerated). **Cfr. fig. 2, d—f.**

According to the notes on the herbarium labels *A. rotundifolium* is always a tree, usually 15—26 m high, with a bole 38—50 cm thick, with flowers fragrant, corolla white or cream-coloured or yellowish, filaments and style white, anthers yellow. It occurs from 400 to 1625 m above sea level.

Marlea tomentosa ZOLLINGER, Syst. Verz. 1842—1848, fasc. 3, p. 63 (1855); *Tetrameles rufinervis* MIQ., Pl. Junghuhn., p. 401 (1855) p.p.; Fl. Ind. Bat., I, 1, p. 726 (1856) p.p.; *Diacoecarpium rotundifolium* HASSKARL, Bonplandia, 7, p. 172 (1859); *Marlea rotundifolia* TEYSM. & BINNEND., Catal. Pl. Hort. Bot. Bogor., p. 238 (1866); GRESHOFF, Meded. 's Lands Plantent., 25, p. 91 (1898); *Alangium begoniifolium* HARMS, in ENGL. & PRANTL, Nat. Pflanzenfam., III, 8, p. 261 (1898) p.p.; *Marlea tomentosa* var. *rotundifolia* KOORD. & VALET., Bijdr. booms. Java, 5, p. 79 (1900); JANSSON., in MOLL & JANSSON., Mikrograph., 3, p. 695, 717 (1918); *Alangium tomentosum* (non LAMARCK 1783) WANGERIN, in ENGL., Jahrb., 38, Beibl. 86, p. 64 (1906) p.p.; KOORDERS, Exkursionsfl. Java, 2, p. 731 (1912) p.p.; *Alangium begoniifolium* ssp. *tomentosum* var. *vulgare* WANGERIN, in ENGL., Pflanzenr., IV, 220b,

p. 22 (1910); *Alangium begoniifolium* ssp. *tomentosum* var. *typicum* (non WANGERIN 1910) HALLIER, Meded. 's Rijks Herb., 1, p. 13 (1911) p.p.; *Alangium begoniifolium* ssp. *tomentosum* KOORD., Exkursionsfl. Java, 2, p. 733 (1912) p.p.; KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 101 (1912) p.p.; KOORD., Fl. Tjib., 2, p. 237 (1923) p.p.; BRUGGEMAN, Bull. Jard. Bot. Buitenz., ser. III, 9, p. 203, 216 (1927) p.p.?; *Marlea begonifolia* RIDL., in Journ. Fed. Mal. St. Mus., VIII, 4, p. 44 (1917); *Alangium chinense* ssp. *tomentosum* var. *vulgare* MERRILL, En. Phil. Fl. Pl., 3, p. 240 (1923)?; *Alangium rotundatum* RIDLEY, ex BURKILL & HENDERS., Gard. Bull. Str. Settl., 3, p. 380 (1925); RIDLEY,, Fl. Mal. Pen., 5, p. 213 (1925); *Alangium Kurzii* (non CRAIB 1911) HENDERSON, Gard. Bull. Str. Settl., 7, p. 107 (1933).

About the synonymy of this species little has to be added. Only the invalidness of the name *Tetrameles rufinervis* must be elucidated with few words. HALLIER (in Meded. Rijks Herb. Leiden, 1, p. 13) mentions that he found this name to be a synonym of *Alangium begoniifolium* ssp. *tomentosum* var. *typicum*. Besides that this remark contains a small mistake (var. *vulgare* had been better), there is a circumstance that invalidates this name. The type in the Leiden Herbarium not only comprises a leafy twig clearly belonging to *A. rotundifolium*, but also a cover containing a fruit, that very probably belongs to the same species, and a number of catkin-like inflorescences belonging to quite a different genus. From MIQUEL's description it is evident, that the name *Tetrameles rufinervis* was based as well upon these inflorescences as upon the leafy twig. Therefore it is impossible to settle, to what genus MIQUEL's *Tetrameles rufinervis* has to be placed, and so this name has no nomenclatorial value at all.

Of the species *Alangium chinense*, *A. rotundifolium* and *A. Kurzii*, distinguished in this paper, KOORDERS and VALETON mention the first as *Marlea begoniaefolia*, the other ones as varieties of *Marlea tomentosa*. WANGERIN mentions them all, as subspecies and varieties, under one specific name, viz. *Alangium begoniifolium*. Having had the opportunity to examine much more materials of these forms than former authors, I endeavour to say, that there are good grounds for taking them apart as three good species. The impression that they are only varieties is taken away especially by a better knowledge of the fruit. The differences between the fruit once known, we can always distinguish the species also by means of differences in leaf-shape, and indumentum, except in some cases of very extreme varieties. Among the three species mentioned, *A. Kurzii* is very uniformous, whereas *A. rotundifolium*, on the contrary, is very polymorphic. Not knowing the characters of the fruit, one is, of course, inclined to unite with the many varieties of *A. rotundifolium* also *A. Kurzii*, as KOORDERS and VALETON did.

About the variability of *A. rotundifolium* the following remarks may be made. The specimens from the Malay Peninsula have leaves sparingly hairy, small flowers (8—18 mm long), large fruit (20—28 mm long); the specimens from Pulo Tioman are also sparingly hairy, but are aberrant by shorter petioles (7—15 mm), strongly asymmetrical leaves with cuneate base, short calyx tube (1 mm), corolla buds not swollen in the basal portion, short filaments (0.75—1 mm), connectives very strongly hairy, disci only 0.5—0.75 mm high. These differences are not important each for themselves, but give a rather uncommon appearance to the plants. The lack of fruit, the occurring of these specimens at an elevation of 60—240 m only, and the existence of glabrous varieties of *A. Kurzii* in Siam, China and Indo-China, justify some doubt, whether these specimens from P. Tioman must not be reckoned to *A. Kurzii*.

The specimen from P. Tinggi is, to a certain degree, intermediate between those from P. Tioman and those from the Malay Peninsula, but by large flowers reminds to forms from Sumatra and Java. For the rest the latter have no special appearance, but are very different in all respects, and also in Java there occur forms that, by the more abundant indumentum, come nearer to *A. Kurzii*, though the fruit of these specimens, if present, is that of pure *A. rotundifolium*; moreover the indumentum is never so dense as in *A. Kurzii* and is of a different nature, viz. more hirsute and never soft-tomentose.

The specimens from Mt. Kinabalu agree with those from the Malay Peninsula as to the leaves. They are, however, remarkable by nearly always 2-celled ovaries and fruit, and connectives sparingly hairy for the species and even glabrous in the upper one-half.

Among the specimens enumerated below, there occur, as among those of *A. chinense*, a number of youth forms, either young plants, or suckers from old roots. They are different by thicker twigs (2—7.5 mm), longer internodes (3—12 cm) and petioles (2.5—20 cm), larger leaf-blades (11.5—27 by 10—26 cm), that are less asymmetrical and more distinctly dentate or lobate. By lack of flowers it is not always certain, whether these forms belong to *A. rotundifolium* or perhaps partly to *A. Kurzii* or *A. chinense*.

MALAY PENINSULA. Perak: below Sea Gardens, 300 m el., CURTIS 2689 (S); Maxwell's Hill, 1200 m el., FOX 122 = RIDLEY 10675 (S); 1140 m el., BURKILL & HANIFF 12851 (B, K, S), type number of *Alangium rotundatum* RIDL.; Gunong Hijau, 1260 m el., HENDERSON 11833 (S); Pahang: Pulau Tioman, Bukit Sukak, 60 m el., HENDERSON & NUR 18554 (S); P. Tioman, Sedagong, 240 m el., HENDERSON & NUR 21750 (K, NY, S); Johore: Pulau Tinggi, BURKILL 907 (S).

SUMATRA. Karo-regions, Laut Kawar, Doesoen Sigaranggarang, 1500 m el., BOSCHPR.BB. 8632 (B), v.n.: *paler boenga*; Kp. Tongkoh, 1500 m el., BOSCHPR.BB. 6818 (B), v.n.: *sikan-ikan*, and 7202 (B), v.n.: *panggang-panggang*; G. Singgalang (near Padang), BECCARI P.S. 68 & 226 (BM, K, L); Airmantjoer (near Padang), 360 m el., BECCARI P.S. 611 (L); G. Kerintji, „Sungei Penoh", 810 m el., ROBINSON & KLOSS 19 (BM, K); Lebong (Bengkoeloe), alt. 700 m, BOSCHPR.BB. 15, 729 (B), v.n.: *moesang*; Rimbo Pengadang (Bengkoeloe), 1000 m el., AJOEB (Exp. JACOBSON) 180 (B); Karanganjar (Redjang, Bengkoeloe), 950 m el., BOSCHPR.BB. 7289 (B), v.n.: *moesang*.

BORNEO. Mt. Kinabalu, Tenompok, 1500 m, CLEMENS 26705 (B, NY), 29650 (B, NY).

JAVA. Without exact locality: „Tikoeet", VAN HASSELT s.n. (L); KORTHALS s.n. (L); FORBES 1899 (L); 900—1800 m el., JUNGHUHN s.n. (KOORDERS' Plantae Junghuhnianae ineditae 58 & 59) (K, L), v.n.: *ki-bungulang*, *ki-hantap*; „Tjipannas" (where ?), 900 m el., ZOLLINGER 803 (B); Tjianten, south of Leuwiliang, near Buitenzorg, 900 m el., BACKER 25721 (B); Nangèla near Poerwasèda, S.W. of Leuwiliang, 450 m, BAKHUIZEN VAN DEN BRINK 7718 (B), v.n.: *mara bangkong*; G. Salak, REINWARDT s.n. (L), v.n.: *kilutong*; KOORDERS 24161 β (B), v.n.: *binong*; G. Gedé, 900—1500 m el., JUNGHUHN s.n. (L); G. Gedé, Tjibodas, SAPIIN 163 (B); 1400 m el., KOORDERS, tree no. 3180a, of which herb. no. 1300 β (B, L), 1301 β (B, L), 12492 β (B), 22215 β (B), 25821 β (B, L), v.n.: *kitjaruh*, *kitjareuh*; G. Boerangrang, N. slope, 1500 m el., BACKER 14187 (B); G. Semboeng, 1300 m el., BACKER 12214 & 12324 (B); Sanggrawa (Djampangkoelon), 400 m el., KOORDERS 1302 β (B, BD, L); Tjadasmalang S. of Tjibeber, 900—1000 m el., BACKER 22538 (B, L); BAKHUIZEN VAN DEN BRINK 1561 (B, BD, L), v.n.: *kitjareuh*; WINCKEL 78 β (B, L, U), 750 β (B),

v.n.: *kitjareuh*; 800 m el., WINCKEL 1570β (B, L, S, U), v.n.: *kitjareuh*; Takokak (Djampangwètan), 1050 m el., KOORDERS 1306 β (B, L); Takokak, way to Soekanagara, 1100 m el., KOORDERS 1307β (B, L), v.n.: *kitjarug?*; G. Wajang, Taloeng, 1625 m el., BOSSCHA s.n. (B), n.v.: *kerteuw*; Pengalengan, 1300 m el., JUNGHUHN s.n. (L, original of *Tetrameles rufinervis* MIQ.), v.n.: *hantap*; G. Telagabodas, forest Pangentjongan, 1300 m el., KOORDERS 13876β (B), 1400 m el., KOORDERS 13982β (B, BD, K, L), v.n.: *kitjaruh*; Pangentjongan, near the pasanggrahan, KOORDERS for. no. 309*, herb. no. 26569β (B, K, L); Garoet, estate Pamegatan, coll. administrator of the estate s.n. (B, L, S); Noesa Gedé, in the Pendjaloe Lake, 700 m el., KOORDERS 47884 β (B), v.n.: *kitjareuh*; Pringamba, Bandjarnegara, 800 m el., KOORDERS for no. 214*, herb. no. 33904 β (B); G. Slamet, 1400 m el., KOORDERS 1308 β (B), v.n.: *tjipir*; G. Prahoe Dièng, N.W. slope, 1400 m el., KOORDERS 1309β (B), v.n.: *ketjipir*; KOORDERS for. no. 14*, herb. no. 11249β (B), v.n.: *lembajoengan*; G. Andong (Kedoe), KOORDERS for. no. 919*, herb. no. 27703β (B, BD, L), v.n.: *woeroe bagoram*; G. Oengaran, near Medini, 900—1200 m, JUNGHUHN s.n. (L, U), v.n.: *tanen* or *kapen*; Kp. Pawangredjo near Malang, 1400 m el., BOSCHPR.JA. 1728 (B), v.n.: *gedrèk*.

BALI. Karangasem, Kp. Poekat Seming, 900 m el., BOSCHPR.BB. 12220 (B), v.n.: *kombang*.

Cultivated in the Buitenzorg Botanic Garden, probably at Tjibodas, s.n., of unknown provenance (B, L), probably the type specimen of *Diacaecarpium rotundifolium* Hasskarl.

6. Alangium Kurzii CRAIB — *Internodes* between the adult leaves 3—9 cm long, 1.5—6 mm thick, tomentose. *Petiole* 13—40 mm long, 1.75—2.5 mm thick, tomentose; lamina mostly triangular-ovate, rarely more roundish or more oblong, not lobate nor dentate, 4—20 cm long, 4—15 cm broad, asymmetrical, the largest half with a rounded basal lobe, the narrow half cuneate at the base, more or less acuminate towards the acute or obtuse apex, thin-coriaceous to chartaceous, short-tomentose on the nerves above, nearly glabrous between them, entirely soft-tomentose below, 5—7-plinervous at the base, moreover with 4—7 lateral nerves at each side of the midrib. *Inflorescence* tomentose, 3—4 × branched, 5—18-flowered, 4.5—5.5 cm long (flowers excluded); peduncle 0.7—4.2 cm long, 1—2 mm thick, pedicels 3—15 mm long, 0.75—1 mm thick, often curvate; bracts filiformous to triangular, 1—3 mm long, 0.5—0.75 mm broad. *Flowers* 18.75—30.5 mm long; calyx tomentose, tube infundibuliformous, campanulate or cylindrical, 1.25—2 mm long, limb spreading, 1—1.5 mm long, 3—3.5 mm wide, with teeth 0.25—0.5 mm long; corolla 7—10- usually 9-merous, in the bud state strongly swollen and 2.75—7 mm wide above the base, nearly cylindrical 2—3 mm wide for the rest, obtuse at the apex; petals 17.5—28.5 mm long, tomentose outside, inside only hairy in the lower dilate portion from 1.5 mm up to 5 mm above the base; stamens as many as petals, 15.5—24.5 mm long, filament 4.5—8 mm long, with a lower portion 4—7 mm long, 0.75—1 mm broad, not thickened inside at the apex, long-pilose outside

and inside, and an upper portion 0.25—1 mm long, 0.5 mm broad, glabrous outside, pilose inside; anther 11—17 mm long, 1 mm broad, the connective long-pilose inside up to the apex; style glabrous, 14.5—23 mm long, nearly 0.5—1 mm thick; stigma capitate 1—1.5 mm long, 1.5—2 mm broad; disc semi-globose, 2.25 mm high, 3 mm in diameter; ovary 2-celled, one of the cells often smaller. *Fruit* usually 2-celled and 2-seeded, with one of the cells and of the seeds often smaller but rarely strongly reduced, in the dry state ellipsoidal, little compressed, nearly rounded at the base, slightly acute towards the apex, 12—14 mm long (calyx included), 6—8 mm broad, 4—7 mm thick, glabrous to thin-tomentose, sometimes superficially grooved, crowned by a calyx limb 1—1.5 mm long, 4—4.5 mm wide, and a disc 2—3 mm high distinctly exserted. (Description after the materials enumerated below). **Cfr. fig. 2, g—i.**

Alangium Kurzii is, according to notes on the herbarium labels, always a tree, up to 28 m high and with a bole up to 57 cm in diameter, in general with larger dimensions than *A. rotundifolium.* The flowers are yellow, more rarely yellowish white, more often dark-yellow or even orange or brick-red, strongly fragrant. The ripe fruit is dark-violet to almost black. The species occurs from 50—1300 m above sea level.

Diacicarpium tomentosum BLUME, Bijdr., 13, p. 657 (1825); MEISN., Genera, 2, p. 111 (1838); (*Diacc.*) HASSK., Cat. Pl. Hort. Bot. Bog., p. 169 (1844); (*Diacacc.*) HASSK., Bonplandia, 7, p. 173 (1859); *Marlea tomentosa* HASSK., Flora, 27, p. 605 (1844); DECAISNE, in JACQUEM., Voyage Ind., 4, bot., p. 75 (1844); MIQ., Fl. Ind. Bat., I, 1, p. 775 (1856); TEYSM. & BINN., Cat. Pl. Hort. Bot. Bog., p. 238 (1866); KURZ, For. Fl. Burma, 1, p. 545 (1877) saltem p.p.; SERTOR., Bull. Herb. Boiss., 1, p. 570 (1893) prob.; GRESHOFF, Meded. Lands Plantent., 25, p. 91 (1898) prob.; *Marlea begoniaefolia* BENTH., Fl. hongkong., p. 138 (1861) p.p.; *Alangium begoniaefolium* RIDL., Fl. Mal. Pen., 1, p. 894 (1922); *Marlea tomentosa* var. *genuina* KOORD. & VALET., Bijdr. Booms. Java, 5, p. 79 (1900); *Alangium tomentosum* (non LAM., 1783) WANGERIN, in ENGL., Jahrb., 38, Beibl. 86, p. 64 (1906) p.p.; KOORD., Exkursionsfl. Java, 2, p. 731 (1912) p.p.; ENDERT, Tectona, 18, p. 91 (1924) prob.; HANDEL-MAZZ., Symb. sin., 7, p. 684 (1933); CHUN, in Sunyatsenia, 2, p. 77 (1934); *Alangium begoniifolium* ssp. *tomentosum* KOORD., Exkursionsfl. Java, 2, p. 733 (1912) p.p.; KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 101 (1912) p.p.; KOORD., Fl. Tjibod., 2, p. 237 (1923) p.p.; BAKER, in Journ. Bot., 62, suppl., p. 45 (1924); BRUGGEM., Bull. Jard. Bot. Buitenz., ser. III, 9, p. 203, 216 (1927) p.p.?; *Alangium begoniifolium* ssp. *tomentosum* var. *typicum* WANGERIN, in ENGL., Pflanzenr., 4, 220b, p. 21 (1910); *Alangium begoniifolium* var. *tomentosum* PALM, Meded. Deli-Proefst., 42, p. 19 (1925); KUYPER, Meded. Deli-Proefst., 45, p. 16 (1926); 53, p. 44 (1927); HEYNE, Nutt. Pl. Ned. Ind., ed. 2, 2, p. 1217 (1927); *Alangium Kurzii* CRAIB, in Kew Bull., 1911, p. 60 (1911); Fl. siam. enum., 1, p. 806 (1931); *Alangium chinense* var. *tomentosum* MELCHIOR, Notizbl. Bot. Gart. Berl.-Dahl., 10, p. 827 (1929);

Alangium chinense EVRARD, in LECOMTE, Fl. Indo-Ch., 2, p. 1187 (1923) p.p.; *Alangium Handelii* SCHNARF, in Akad. Anzeiger, Akad. Wiss., Wien, n. 12, p. 107 (1922); MELCHIOR, Notizbl. Bot. Gart. Berl.-Dahl., 10, p. 827 (1929); CHUN, in Sunyatsenia, 1, p. 278 (1934).

For the distinction of this species from *A. chinense* and *A. rotundifolium* cfr. the discussion of *A. rotundifolium*. The oldest species name in the genus *Alangium*, viz. *A. tomentosum* (BLUME) WANGERIN, is preoccupied by *A. tomentosum* LAMARCK; therefore the following name must be chosen, viz. *A. Kurzii*, of which I shaw the type (KERR 1172) in the Kew Herbarium. Though the average fruit dimensions of the Siamese specimens, to which the type belongs, are somewhat smaller (7.5—12 mm long), this seems insufficient to have any doubt about the specific identity of the Siamese and the Malaysian specimens.

MALAY PENINSULA. Penang: Pulu Bootong Reserve, 150 m el., CURTIS 940 (K, S); Selangor: Kepong Plantations, SOW & TACHOU 16857 (S).

SUMATRA. Bintangmeriah, W.S.W. of the Sinaboeng, 750 m el., LÖRZING 8960 (B, L), wild in ravines and planted in the kampongs, v.n.: *kalimbangbang*; Sibolangit, forest reserve, 500 m el., LÖRZING 5131 (B, L, S); Berastagi, SYMINGTON 24688 (S); Karo-regions, Katjariboe, W. of Kabandjahé, 1100 m el., GALOENGI 325 (B, L), v.n.: *kalibambang*; near Sembaikan, 190 m el., BOSCHPR.BB. 9737 (B), v.n.: *kalibangbang*; Sigorang-gorang, 1300 m el., BOSCHPR.BB. 9730 (B, L), v.n.: *kalibamban*; Masihat (afd. Simeloengoen), 150 m el., BOSCHPR.BB. 5340 (B, L), v.n.: *mohoe*; Bandarpoelau (afd. Simeloengoen), 50 m el., BOSCHPR.BB. 4922 (B, L), v.n.: *mahoe*; Porsea, 950 m el., planted in fences, LÖRZING 10058 (B), v.n.: *haoe hombo* (?); Sajoer Matinggi (afd. Angkola & Sipirok), 310 m el., BOSCHPR.BB. 4006 (B), v.n.: *hajoe misang*, Kp. Simatarkis, 450 m el. (afd. Angkola & Sipirok), 450 m el., BOSCHPR.BB. 5646 (B, L), v.n.: *hale misang*; Asahan, Silo Maradja, BARTLETT 8703 (NY); Benantigo, near G. Malintang, 1150 m el., BÜNNEMEIJER 3754 (B, L); Fort de Cock, Harau-Kloof, 450 m el., YATES 2485 (B, NY); Fort de Cock, James Park, 920 m el., THEUNISSEN 8 (B, L), v.n.: *moesang*; Lematang Hoeloe (Palembang), 150 m el., LAMBACH 1232 (B, L, S), v.n.: *èndeloepang*; Lematang Hilir (Palembang), near Goenoeng Megang, alt. 75 m, BOSCHPR. E. 1218 (B), v.n.: *koendoer*; Tandjoeng Ning, R. Bliti (Palembang), 180 m el., FORBES 2785 (BM, L, S), v.n.: *kayoe doe-etteh*.

JAVA. Without exact locality: BLUME s.n. (B, BD, L, NY, U, originals of *Diacicarpium tomentosum* BL.); JELINEK (Exp. Novara) s.n. (B); Bandoeng, estate Rongga, DES AMORIE VAN DER HOEVEN s.n. (B), v.n.: *kitjareuh*; G. Salak, BLUME s.n. (BM, L, originals of *Diacicarpium tomentosum* BL.), v.n.: *kilutung*; Pengalengan, near estate Ardjasari, 1000 m (?) el., KOORDERS for. no. 3701*, herb. no. 22258β (B, BD, K, L) (in KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 102, with incorrect locality); forest Soember Tangkil (G. Kidoel, Pasoeroean), 400—500 m el., KOORDERS for. no. 2971*, herb. no. 23986β (B, L).

Cultivated in the Botanic Garden at Sibolangit under no. 80 (S, NY).

Further distribution: China, Southern Burma, Siam, Indo-China, Philippines (?).

7. **Alangium scandens** BLOEMBERGEN, n. sp. — *Internodia* inter folia adulta 1.5—9 cm longa, 1.2—5 mm crassa, iuventute dense piloso-tomentosa, glabrescentia. *Petioli* 11—26 mm longi, breve appresseque piloso-tomentosi; lamina ovata vel ovato-oblonga, subsymmetrica, 6—17 cm longa, 5—10 cm lata, basi plerumque rotundata vel subcordata,

raro uno latere cuneata, longiuscule et abruptiuscule acuminata versus apicem obtusum, chartacea vel tenuiter coriacea, omnino penninervis lateralibus utrinque 7—9, facie superiore glaberrima, facie inferiore appresse piloso-tomentosa in nervis crassioribus. *Inflorescentia* piloso-tomentosa, glabrescens, 3—4 × ramosa, 17—31-flora, 3—6 cm longa (floribus exceptis); pedunculus 9—40 mm longus, pedicelli 0—9 mm longi, bracteae lineares vel filiformes, raro foliaceae, 2.25—20 mm longae, 0.5—4 mm latae. *Flores* 5—7-, plerumque 6-meres, 12—15 mm longi; calyx tomentosus, tubo infundibuliformi vel campanulato, 2 mm longo, limbo patente, 0.75 mm longo, 2.5 mm lato, dentibus 0.5 mm longis; corolla statu alabastri inflata, 2—3.5 mm crassa in parte basali, ceterum subcylindrica 1.5—2 mm lata, apice obtuso; petala 10—13 mm longa, facie exteriore appresse piloso-tomentosa, facie interiore parte basali marginibus pilosis; stamina tot quot petala, 8—11.25 mm longa; filamenta 3—4 mm longa, curva, apice incrassata et barbata, marginibus pilosa, dorso puberula praecipue in parte media; anthera 4.5—7.5 mm longa, 1 mm lata, connectivo longe sericeo piloso facie interiore usque ad apicem; stylus glaber, 7—10 mm longus, 0.6—1 mm crassus; stigma capitatum, 0.75 mm altum, 1.25 mm latum; discus semiglobosus, 5—7-angularis, 1.5 mm altus, 2 mm diametro; ovarium uniloculare. *Fructus* statu sicco oviformis, basi rotundatus, calycem versus subacuminatus, 11—13 mm longus (calyce incluso), 6—7 mm latus, 5.5—6 mm crassus, glabrescens, nonnunquam leviter 10—14-costatus, calycis limbo 0.25—1 mm alto 3.5—4 mm diametro et disco 1.5—2 mm alto distincte exserto coronatus. (Description after the materials under mentioned). **Cfr. Fig. 2, k—l.**

Alangium scandens belongs, as to the characters of the flowers, inflorescences and fruit, in the alliance of *A. chinense*, *A. rotundifolium*, *A. Kurzii* and *A. Griffithii*. By the pilose connective and the glabrous style it comes nearest to *A. rotundifolium* and *A. Kurzii*, but it is easily distinguished from all species mentioned by the ovate-oblong leaves not at all palminervous at the base. In the mode of ramification *A. scandens* agrees with *A. Griffithii*, and strongly differs from the other species mentioned.

Sumatra. Between Arnhemia and Sibolangit, 250 m el., LÖRZING 6322 (B), somewhat climbing shrub, flower-buds yellow-green; N.N.W. of Bandarbaroe, 800 m el., LÖRZING 6387 (B, L), more or less climbing shrub about 5 m high, open flowers nearly white; border of Lau Betimoes, 375 m el., LÖRZING 5714 (B), crooked tree-like shrub, with overhanging crown, nearly 8 m high; Soebanajam (Bengkoeloe), 1200 m el., AJOEB (Exp. JACOBSON) 370 (B, L).

Borneo. Sarawak, Mt. Buan, GARAI (HAVILAND) 2018 (K, Sa), rambling shrub,

flowers pale-yellow; E. Borneo, Long Petah, 400 m el., ENDERT 4076 (B, first type, with flowers), woody climber, flowers cream-coloured outside, nearly white inside; ENDERT 4052 (B, second type, with fruit), woody climber.

8. **Alangium Griffithii** (CLARKE) HARMS — *Internodes* between the adult leaves 1.7—5 cm long, 2—6 mm thick, tomentose or hirsute-tomentose, more sparingly hairy later. *Petiole* 4—12 mm long, tomentose or more sparingly short-hairy later; lamina ovate-oblong to ovate-lanceolate, rarely ovate or somewhat obovate, asymmetrical, 4.2—18.6 cm long, 2—7.5 cm broad, usually rounded at the base, the broader half usually with large rounded basal lobe, the narrower half usually cuneate, usually rather abruptly and long-acuminate towards the acute or obtuse apex, chartaceous, sparingly hairy on the nerves, usually glabrous between the nerves above, glabrous to densely hirsute-tomentose on the thicker nerves, less hairy on the finer nerves, rarely entirely hirsute-tomentose below, 3—5-plinervous at the base, moreover with 3—5 lateral nerves at each side of the midrib. *Inflorescence* tomentose, 3—4 × branched, 6—61-flowered, 1.5—4.5 cm long (flowers excluded); peduncle 0.65—2.5 cm long, pedicels 0—2 mm long, bracts filiformous, rarely linear or foliaceous, 0.25—14 mm long, 0.2—0.75 mm broad. *Flowers* 9—18 mm long; calyx tomentose or more sparingly hairy, tube campanulate 1—2.5 mm long, limb spreading, 0.25—0.5 mm long, 2.5—3 mm wide, with teeth 0.25—0.5 mm long; corolla 4—6- usually 5-merous, in bud subcylindrical somewhat swollen up to 3 mm thick in the basal portion, very slightly thickened in the upper one-half, obtuse; petals 8—15.5 mm long, finely short-hairy or more glabrous outside, with few hairs along the margins, at the top of the dilate part and on the midrib inside; stamens as many as petals, 7—14 mm long, filament 3—4.5 mm long, with a lower portion 1.5—2.75 mm long, 1 mm broad, hairy inside at the margins, thickened and bearded at the apex, glabrous outside, and an upper portion 1.5—2.25 mm long, 0.75 mm broad, glabrous; anther 4—9.5 mm long, 0.75 mm broad, sometimes sterile and narrower, the connective glabrous; style glabrous, 0.25—0.75 mm thick; stigma capitate, 0.25—0.5 mm long, 0.8—1 mm in diameter; disc 4—6-angular, 0.75—1 mm high, 1.25 mm in diameter; ovary one-celled. *Fruit* in the dry state oviformous, flattened, rounded at the base, acute or somewhat acuminate towards the apex, 12—18 mm long (incl. calyx limb), 9—12 mm broad, 5—8 mm thick, usually glabrous, rarely superficially grooved, crowned by a calyx limb 0.25—0.75 mm high, 1.25—2 mm wide, and a disc 1 mm high, as high as the calyx or slightly exserted. (Description after all materials under-mentioned). **Cfr. fig. 2, m—n.**

According to notes on herbarium labels *A. Griffithii* is a small or

moderate-sized tree, up to 18 m high, with a stem up to 30 cm in diameter, sometimes with buttresses up to 50 cm wide and spreading 50 cm, with leaves not falling off in the dry season and flowering from April to September (dry season) with flowers white to light-cream-coloured and sweet, sometimes strongly sweet scented, and with cobalt-blue ripe fruit to November. It occurs from 60—400 m above sea level.

It is remarkable that there are, among the herbarium materials, some specimens with sterile stamens in all flowers (FORBES 2813, KOORDERS 15691β, 28897β, and RUTTEN 1831); of these specimens the stamens are shorter than the style, the anthers are short, thin and obtuse, the pollen is little-developed, and the grains are shrivelled, the stigma is thicker. A similar phenomenon I observed in *A. salvifolium* ssp. *decapetalum*, especially in the Siamese specimens (e.g. HOSSEUS 440), but here the filaments were long, the anthers short and shrivelled, the stamens less in number than in fertile flowers, the stigma also strongly developed; but in this species I found also fertile stamens on the same plant and even in the same flower with sterile stamens.

For the systematic place of *A. Griffithii* among its nearest allies cfr. *A. scandens*; here I will, moreover, remark, that *A. Griffithii* also shows resemblance with *A. villosum* and other species with bifid style, by the form and indumentum of the leaves, and by the mode of ramification.

Marlea Griffithii CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 742 (1879); *Karangolum Griffithii* KUNTZE, Rev. gen. pl., 1, p. 273 (1891); *Alangium Griffithii* HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); WANGERIN, in ENGL., Jahrb., 38, Beibl. 86, p. 61—65 (1906); *Marlea densiflora* KOORD. & VALET., Bull. Inst. Bot. Buitenz., 2, p. 2 (1899); Bijdr. Booms. Java, 5, p. 84 (1900); KOORD., Nat. Tijdschr. Ned. Ind., 60, p. 380 (1901); JANSSON., in MOLL & JANSS., Mikrogr., 3, p. 695, 716 (1918); *Alangium uniloculare* (non *Marlea unilocularis* GRIFFITH, 1854!) KING, Journ. As. Soc. Beng., 71, II, p. 77 (1902); WANGERIN, in ENGL., Pflanzenr., IV, 220b, p. 15 (1910); RIDL., Fl. Mal. Pen., 1, p. 894 (1922); BAKER, Journ. Bot., 62, suppl., p. 45 (1924); CRAIB, Fl. siam. enum., 1, p. 808 (1931); *Alangium myrianthum* WANGERIN, in ENGL., Jahrb., 38, Beih. 86, p. 62, 65, 67 (1906); in FEDDE, Repert., 4, p. 339 (1907); in ENGL., Pflanzenr., IV, 220b, p. 17 (1910); KOORD., Exkursionsfl., 2, p. 733 (1912); *Alangium densiflorum* WANGERIN, in ENGL., Pflanzenr., IV, 220b, p. 17, ic. 4, A—E (1910); KOORD., Exkursionsfl. Java, 2, p. 731, 733 (1912); KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 102 (1912); KOORD. & VALET., Atlas, 1, t. 188 (1913); DOCT. v. L., Zoocec. Neth. Ind., p. 438 (1926).

As CLARKE did not elucidate, why he called this species *Marlea Griffithii* it is generally accepted, that the oldest name for it is *Marlea unilocularis* GRIFFITH. The latter name, however, is an obscure one. In GRIFFITH's Icones, 4, t. 639, there is a *Marlea begonifolia*, clearly representing *Alangium chinense*. There is a reference to Notulae 3, p. 679, but on this place we find no *Alangium* at all. In Notulae 4, however, on the same page, we find a *Marlea unilocularis*, with description. It is

not impossible, that this description really represents our species, but there are some objections, and for the rest the supposition cannot be proved. These objections are: 1°. that in the description the style is called pubescent, 2°. that the reference from the plate to the description possibly bears on the description of *M. unilocularis*, and in that case *M. unilocularis* would be synonymous with our *A. chinense*

MALAY PENINSULA. Perak: 90—150 m el., KING's coll. 8281 (BD); Upper Perak, 90 m el., WRAY 3486 (E, S); Assam Kumbong, plains, WRAY 2927 (S); Larut, 60—240 m el., KING's coll. 3329 (BM, L), 3593 (B, L), 5824 (K); Ulu Bubong, 120—180 m el., KING's coll. 10183 (K, L); Gopeng, KING's coll. 563 (BD, K); Pahang: 8 miles S. of Kuala Lipis, BURKILL & HANIFF 17069 (B, K, S); Tembeling, HENDERSON 24546 (B, S); Rumpin, LAMBAH 2720 (K, S) v.n.: *piane*; Selangor: Kuala Lumpur, Weld Hill Reserve, HASHIM 493 (S); CUBITT's coll. 889 (S), v.n.: *salang rusa*; BURN MURDOCH 14152 (BM, L); OMAR 8538 (K, S), v.n.: *salang rusa*; Sungei Buloh Forest Reserve, ABU 6505 (S), v.n.: *salang rusa*, ABU 2297 (K, S), v.n.: *tengual lawat*; Kepong Selangor, SOW & TACHOU 16446 (S), v.n.: *salang rusa*; SYMINGTON 21051 (S); Ampang Road, MAJID PEON 11622 (S), v.n.: *salang rusa*; Malacca: MAINGAY, Kew distr. 708 (K); GRIFFITH, Kew distr. 3387 (K); Johore: Bukit Patam, Batu Pahat, RIDLEY 11095 (S); Kluang, HOLTTUM 9310 (B, BM, K, S); Singapore: Bukit Timah, RIDLEY 4578 (BM, K, S); Sungei Buloh, RIDLEY s.n. (S).

SUMATRA. Asahan, forest reserve Masihi, KRUKOFF 4243 (NY); Palembang, Tandjong Ning, FORBES 2812 (L), 2813 (BD, L); Tandjong Ning, R. Bliti, 180 m el., FORBES 2739 (BM, L, S); Lampongs, G. Raté, Telanggoran, 400 m el., IBOET 39 (B, BD, K, L).

BORNEO. Sarawak, Upper Rejang River, Kapit, low el., CLEMENS 21049 (B, NY, Sa); E. Borneo, near the northern frontier, Tikoeng, AMDJAH 807 (B, L, UC).

JAVA. Palaboehanratoe, KOORDERS tree no. 1330a, herb. no. 33038β (B), 15691 β (B, BD, K, L) first type of *Marlea densiflora* KOORD. & VALET.; Ragadjampi, near Banjoewangi, forest Sebanen, KOORDERS tree no. 7922w, herb. no. 10073 β (B, L), 39303 β (B, L), 28897 β (B, K, L), 13191 β (B), second type of *Marlea densiflora* KOORD. & VALET., wrongly cited Kds. 31191β by KOORD. & VAL. l.c.; forest near Genteng, for. no. 1706*, herb no. 20998 β (B); near Kp. Kaligoeng, KOORDERS for. no. 1121*, herb. no. 28895 β (B, L); Blimbangan, ZOLLINGER 3907 (W, type of *Alangium myrianthum* WANGER.).

SELEBES. Subdiv. Malili, near Kampong Kawata, alt. 250 m, BOSCHPR. CEL. V, 128 (B), v.n.: *manata*.

HALMAHÉRA. Soa Tobaroe, 60 m el., BEGUIN 1977 (B), v.n.: *dodaara*.

SÉRANG. Wai Kawa (NW. Séran), 100—200 m el., RUTTEN 1831 (B, L, U).

Further distribution: Siam.

Section III. *Stamens as many as petals and calyx teeth. Style cylindrical, deeply divided into 2 long branches stigmatose at the inside. Endosperm smooth. Radicle shorter than half the length of the cotyledons.* Species 9—11. **Fig. 3.** — Twigs monopodial, branching from the axils of the last vegetation period. Leaves entirely penninervous. Inflorescences with distinct peduncle, branches and pedicels, but with little developed bracts. Style glabrous or hairy. Ovary one-celled. Fruit and seed slightly flattened.

9. **Alangium villosum** (BLUME) WANGERIN — *Internodes* between the adult leaves 0.8—6 cm long, 0.75—5.5 mm thick, thin-tomentose to hirsute-tomentose. *Petioles* 3—13 mm long, hairy like the twigs; lamina ovate-oblong to lanceolate, rarely somewhat obovate, asymmetrical, 4—19 cm

Fig. 3: *Alangium* sect. III. **a—f**: *A. villosum* var. *tomentosum*; **a**: twig fragment with leaves and inflorescences, $^3/_5 \times$; **b**: calyx with pistill, $2^1/_2 \times$; **c**: stamen, $2^1/_2 \times$; **d**: fruit, $^3/_5 \times$; **e**: transverse section of the fruit, $2^1/_2 \times$; **f**: embryo, $2^1/_2 \times$; **g—h**: *A. ferrugineum*; **g**: stamen, $2^1/_2 \times$; **h**: fruit, $^3/_5 \times$; **i—l**: *A. Warburgianum*; **i**: fruit, $^3/_5 \times$; **k**: calyx with pistill, $2^1/_2 \times$; **l**: stamen, $2^1/_2 \times$; **a** after KOORDERS 38191 β, **b**, **c**, after KOORDERS 38376β, **d**, **e**, **f**, after KOORDERS 28896β, **g**, **h**, after BRASS 1066, **i**, **k**, **l**, after WARBURG 18116.

long, 1.5—7.5 cm broad, usually cuneate at the base or the broader side rounded, more or less acuminate towards the acute or obtuse apex, chartaceous, penninervous, with 5—10 lateral nerves at each side of the midrib, glabrous or sparingly hairy on the upper side except on the midrib tomentose in the basal portion, hirsute-tomentose on the lower

surface, especially on the nerves and veins. — *Inflorescence* hirsute-tomentose, 2—4 × branched, 2—30-flowered, 6—55 mm long (flowers excluded), the peduncle 3—25 mm long, the pedicels 0—6 mm long; bracts oblong to filiformous, 0.25—3 mm long, 0.5—0.6 mm broad. *Flowers* 4—7-usually 5-merous, 8.5—12 mm long; calyx tube tomentose, campanulate, 1.5—2 mm long, limb cupuliformous-infundibuliformous, 0.5—0.75 mm long, 1.75 mm wide, with teeth 0.2—0.5 mm long; corolla-bud subcylindrical, 1—2 mm thick ,thickened in the basal part to 2.5 mm, also slightly swollen in the upper portion, obtuse; petals 7—10 mm long, tomentose outside, inside tomentose in the basal dilate portion, nearly glabrous or sparingly hairy for the rest; stamens as many as petals, 5.5—9 mm long, filaments 2—3.5 mm long, with a basal portion 1.5—2.5 mm long, 0.75—1 mm broad, flattened and bearded inside at the top, and an upper portion 0—1 mm long, 0.5 mm broad, glabrous; anther 3.5—5.5 mm long, 0.5 mm broad, with glabrous connective; style glabrous, 3.5—5.5 mm long, 0.3—0.5 mm thick; stigma entirely split into 2 acute lobes curved outward 1.5—3 mm long; disc 4—7-angular, 0.25 mm high, 0.8—1.5 mm in diameter; ovary one-celled. *Fruit* in the dry state ellipsoidal to globose, sometimes flattened, rounded at the base and the apex, 10—17 mm long (incl. calyx limb), 7—10 mm broad, 6—8 mm thick, glabrous or short-hairy, with 8—12 superficial grooves, crowned by the calyx limb 0.75—1 mm high and 0.5—2 mm wide and the non-exserted disc, in alcohol materials 12 mm long, 11 mm in diameter, not grooved. (Description after all the materials mentioned below, with exception of the flowers of the var. *parviflorum* not known in the opened state, but probably smaller than those of the var.s *salaccense* and *tomentosum*). **Cfr. fig. 3, a—f.**

According to the notes on herbarium labels *A. villosum* is a tree up to 17 m high and with a trunk up to 40 cm in diameter, with greenish- or yellowish-white corolla and style, white stamens and dark-red fruit. It occurs at an altitude of 5 to 1400 m, and flowers from August to November (end of the dry season).

A. villosum has been collected only in a few localities in western and eastern Java and in Flores. It is peculiar that the specimens from western Java are rather strongly different from those from eastern Java, and these again from those from Flores. I agree with KOORDERS en VALETON, who consider all the Java specimens to belong to one species, as the flowers are hardly different; the main differences are in the foliage and in the number of flowers in the inflorescences. The specimens from eastern Java are hardly different from the Australian *A. vitiense*

(GRAY) HARMS var. *tomentosum* BENTH., and I suppose that also *A. ferrugineum* C. T. WHITE, *A. vitiense* (GRAY) HARMS, *A. pilosum* MERRILL, and *A. Bussyanum* (BAILLON) HARMS, and perhaps even *A. Warburgianum* WANGERIN, are only varieties of the same species. It is therefore that also the Timor form, of which no open flowers are known, but that closely resembles *A. pilosum* MERRILL, is taken by me as a variety of *A. villosum*.

Styrax villosum BLUME, Bijdr., 13, p. 671 (1825) α; A. DE C., in D. C., Prodr., 8, p. 268 (1844) α; ZOLLING., Syst. Verz. 1842—1848, Heft 2, p. 135 (1854—1855) α; MIQUEL, Fl. Ind. Bat., I, 2, p. 464 (1859) α; KURZ, in Journ. As. Soc. Beng., 40, II, p. 61 (1871) α; BOERL., Hand. Fl. Ned. Ind., 2, p. 232 (1891) α; GRESHOFF, Schetsen, p. 118 (1896) α; KOORD. & VAL., Bijdr. booms. Java, 7, p. 131 (1900) α; PERKINS, in ENGL., Jahrb., 31, p. 484 (1902) α; in Engl., Pflanzenr., IV, 241, p. 85 (1907) α, VAN STEENIS, in Bull. Jard. Bot. Buitenz., ser. III, 12, p. 253 (1932) α; *Pseudalangium polyosmoides* var. *tomentosum* F. v. MUELL., Fragmenta, 2, p. 85 (1860—61); *Alangium Zollingeri* BAILLON, Adansonia, 5, p. 195 (1864—65)β; HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 261 (1898)β; WANGERIN, in ENGL., Bot. Jahrb., 38, Beibl. 86, p. 63 (1906)β; *Marlea vitiensis* var. *tomentosa* BENTH., Fl. austr., 3, p. 386 (1866) β; BAILEY, Queensl. Fl., 2, p. 737 (1909) prob. β; KOORD. & VAL., Bijdr. Booms. Java, 5, p. 73 (1900) β, cum fm. *salacoensis*, α; BAILEY, Compr. Cat. Queensl. Pl., p. 236, 238, ic. 203 (1909) prob. β; JANSSON, in MOLL & JANSS., Mikrogr., 3, p. 695, 709 (1918) β; *Marlea villosa* KURZ, in Journ. As. Soc. Beng., 40, II, p. 61 (1871) α; in Flora, 54, p. 304 (1871)α; in Nat. Tijdschr. Ned. Ind., 34, p. 107 (1874)α; *Karangolum Zollingeri* KUNTZE, Rev. gen. pl., 1, p. 273 (1891)β, *Alangium villosum* WANGERIN, in ENGL., Jahrb., 38, Beibl. 86, p. 61 (1906)α; in ENGL., Pflanzenr., IV, 220b, p. 18 (1910)α; KOORD., Exkursionsfl. Java, 2, p. 733 (1912)α, β; KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 103 (1912) α, β; KOORD. & VALET., Atlas, 1, p. 186 (1913)β *Alangium vitiense* var. *tomentosum* WANGERIN, in ENGL., Bot. Jahrb., 38, Beibl. 86, p. 63 (1906)β; in ENGL., Pflanzenr., IV, 220b, p. 19 (1910) β; DOMIN, in Bibl. bot., 22, p. 999 (1921) prob. β; *Alangium vitiense* KOORD., Exkursionsfl. Java, 2, p. 731 (1912) α, β.

Var. **salaccense** (KOORD. & VALET.) BLOEMB., nov. comb. — Internodes between the adult leaves 0.75—4.5 cm thick, 0.8—8.5 cm long. Petioles 3—8 mm long; laminae oblong to lanceolate, 4—14 cm long, 1.5—6 cm broad, cuneate at the base or rounded at the broader side. Inflorescences once to twice branched, 2—5-flowered, 6—19 mm long, with peduncle 3—7 mm long and pedicels 1.5—4 mm long; bracts oblong to triangular, 1.5—3 mm long, 0.5—0.6 mm broad. Flowers 8.5—12 mm long.

For the synonyms cfr. those marked with α in the general list.

JAVA. Without exact locality, but very probably W. Java; coll. unknown, s.n. (B, BD, L, NY) v.n.: *kitamieang, kitamiang*; 900—1800 m alt., JUNGHUHN s.n. (L) v.n.: *anjereh*; ZOLLINGER 785 Z. (BD); Priangan, NAGEL 226 (BD); West-Java, 900—1800 m alt., JUNGHUHN s.n. (L) v.n.: *kilalayoe*; G. Gedé, „houtsoorten van den Gedeh 175" (L) v.n.: *kilalayoe*; G. Salak, or cultivated in the Buitenzorg Botanic Garden, BLUME s.n. (L, U, at least partly originals of *Styrax villosum* BLUME).

Var. **tomentosum** (F. v. MUELL.) BLOEMB., nov. comb. — Internodes between the adult leaves 2.5—5.5 mm thick, 2—6 cm long. Petioles 6—

13 mm long; laminae ovate-oblong to lanceolate, cuneate at the narrower side of the base, rounded at the broader side, 6.5—19 cm long, 2.8—7.5 cm broad. Inflorescences 3—4 × branched, 9—30-flowered, 14—55 mm long, the peduncle 8—25 mm long, the pedicels 0—6 mm long, the bracts triangular to obovate, 0.25—3 mm long, 0.5 mm broad. Flowers 8.5—12 mm long.

JAVA. Gerbo (Pasoeroean), 750 m alt., MOUSSET 1075 (B, L); G. Ardjoena, 1400 m alt., KOORDERS for. no. 2271*, herb. no. 38191 β (B, L); forest Tjoeramanis (Simpolan near Djember), KOORDERS for. no. 4035w, herb. no. 10038 β (B) v.n.: *tandjong goenoeng*, 38497 β (B), 40054β (B); for.no. 4178w, herb. no. 10050 β (B) v.n.:*roekdjeroekan*, 21103 β (B), 38376 β (B, L), 39954 β (B); for. no. 4187w, herb. no. 10051 β (B), v.n.: *gumbir*, 21100 β (B), 28757 β (B, L); for. no. 4217w, herb. no. 20747 β (B), 30343 β (B, L), 38429 β (B), 40076β (B); for. no. 4229w, herb. no. 10057 β (B), v.n.: *kodjoek*, 10059 β (B), 20748 β (B), 38425 β (B), 40075β (B), for. no. 4271w, herb. no. 3766β (B) v.n.: *kasidjan*, 10061 β (B), 21044 β (B, L), 21101 β (B). 30885 β (B, L), for. no. 4297w, herb. no. 3767β (B), v.n.: *kosang*; forest Pantjoer Idjen (near Sitoebondo, Besoeki), 1000 m el., KOORDERS 14387β (B, L), for. no. 4191t, herb. no. 14388 β (B, L), 28511 β (B, L), for. no. 4206t, herb. no. 14385 β (B, L), 14639 β (B), for. no. 4219t, herb. no. 14640 β (B, BD, L), 14902 β (B, K, L); forest Noesabarong, near Djember, KOORDERS 10087 β (B, BD, L); forest Ragadjampi Balak (near Banjoewangi), KOORDERS for. no. 7844w, herb. no. 8585 β (B), v.n.: *koeniran*, 8586 β (B) v.n.: *koeniran*, 8587 β (B, L), 38896β (B, L), for. no. 7926*, herb. no. 8534 β (B, L), v.n.: *koeniran*; forest Ragadjampi Balak, near Kp. Kaligoeng-gintongan, KOORDERS 8535 β (B); for. no. 1120*, herb. no. 28896 β (B, BD, K, L, U), v.n.: *koeniran*; Moentjar (S.E. Besoeki), alt. 5 m, BECKING 56 (B), v.n.: *koeniran*.

Further distribution: eastern Australia.

Var. **parviflorum** BLOEMB., n var. — Internodia inter folia adulta 1—3 mm crassa, 6—45 mm longa. Petioli 5—8 mm longi; laminae ovato-oblongae, 6.5—10 cm longae, 2.8—3.2 cm latae, basi utrinque cuneatae sed latere latiore magis rotundatae. Inflorescentiae 2—3 × ramosae, 11—16-florae, 12—17 mm longae, pedunculo 3—7 mm longo, pedicellis 1.5—2.5 mm longis. Flores statu alabastri nondum adulti tantum noti, 3—3.5 mm longi.

FLORES. Kp. Boehe Soge (Maoemere), alt. 250 m, BOSCHPR.BB. 11370 (B, type), v.n.: *lalimera*, tree, 22 m high, its bole 14 m high, 38 cm diam., 7 II 1927.

With this the following materials without flowers nor fruit look entirely identical: Flores, Manggarai, near Wailako, alt. 10 m, BOSCHPR.BB. 14,352 (B), v.n.: *woenis*.

10. **Alangium ferrugineum** C. T. WHITE — *Internodes* between the adult leaves 2—3.5 cm long, 2—3.5 mm thick, densely and shortly hirsute-tomentose, nearly velutinous. *Petiole* 8—10 mm long, hairy like the twigs; lamina ovate-oblong to oblong, asymmetrical, 10.5—17.5 cm long, 3.8—7 cm broad, cuneate on one side, rounded on the other side at the base, rather strongly acuminate towards the acute apex, chartaceous,

pennincrvous with 4—7 lateral nerves at each side of midrib, glabrous above with exception of the appressedly hairy basal part of the midrib, the nerves and veins beneath hairy like the petiole, but less densely and the hairs shorter. *Inflorescence* and calyces velutinous like the twigs, 2—3 × branched, 8—15-flowered, 20—25 mm long (flowers excluded), the peduncle 12—21 mm long, the pedicels 1—5 mm long; bracts triangular to lanceolate, 0.5—2.25 mm long, 0.5—0.75 mm broad. *Flowers* usually 5-merous, 15—16 mm long; calyx tube nearly cylindrical or somewhat infundibuliformous, 2.5 mm long, the limb nearly erect, slightly campanulate-infundibuliformous, 2 mm long, 2.25—2.5 mm wide, with teeth 0.4 mm long; adult corolla in bud subcylindrical, slightly clavate, obtuse, nearly 1.5 mm thick in the basal portion, 3 mm in the upper portion; petals nearly 14 mm long, densely sericeous-villose outside, glabrous inside; stamens as many as petals, 8—8.5 mm long; filaments nearly 5 mm long, flattened, with a basal portion 3 mm long, 0.5 mm broad, bearing few sericeous hairs inside at the apex, and an upper portion 2 mm long, 0.25—0.3 mm broad, entirely sericeous-pilose, but the hairs on the inside longer than on the outside; anther 3—3.5 mm long, 0.3—0.4 mm broad, with glabrous connective; style 7 mm long, 0.3—0.4 mm thick, sparingly sericeous-hairy, especially towards the apex; stigma entirely divided into 2 linear obtuse lobes 3—4 mm long and curled outward; disc forming a flat and narrow ring around the style base, 0.3 mm high, 0.75 mm in diameter; ovary one-celled. *Fruit* in the dry state oblong-ovate, slightly flattened, very shortly contracted at the base, long-conical towards the apex, 30—31.5 mm long, 12—14 mm broad, 8—10 mm thick, hirsute-tomentose, glabrescent, with about 10 superficial ribs, crowned by the persistent calyx limb 2.5 mm high and 3 mm wide, and the non-exserted disc. (Description after the materials mentioned below). **Cfr. ic. 3, g—h.**

Alangium ferrugineum C. T. WHITE, Journ. Arn. Arbor., 10, p. 248 (1929).

Closely allied to *Alangium villosum*, of which it perhaps is a variety. Cfr. also the determination key and the discussion of *Alangium villosum*.

NEW GUINEA. South-eastern Part (Papua), Vailala River, Aroara, 60 m el., in rain forest, BRASS 1066 (Br, type), handsome tree, 7.5 m high, leaves dark and glossy above, flowers white, fruit yellow, cylindrical.

11. Alangium Warburgianum WANGERIN — *Internodes* between the adult leaves 1—5 cm long, 1.5—3 mm thick, more or less densely appressedly pilose, glabrescent. *Petiole* 9—13 mm long, rather densely appressedly pilose; lamina usually obovate-lanceolate, more rarely oblong or lanceolate, nearly symmetrical, 6.5—17 cm long, 2.2—5.8 cm broad, cuneate at the base, rather abruptly acuminate towards the obtuse apex,

chartaceous, glabrous above, appressedly pilose on the thickest nerves below, penninervous with 6—8 lateral nerves at each side of the midrib. *Inflorescence* densely appressedly sericeous-pilose, almost tomentose, 1—2 × branched, 3—5-flowered, 12—18 mm long (flowers excluded); peduncle 3.5—9 mm long, pedicels 4—7 mm long; bracts triangular to filiformous, 0.25—1.5 mm long, 0.25—0.5 mm broad. *Flowers* 5-merous, 7.75—12 mm long; calyx densely appressedly pilose, the tube campanulate, 1.75—2 mm long, the limb cupuliformous, 1 mm long, 2 mm wide, with 5 lingulate teeth 1.5 mm long, obtuse; corolla in bud cylindrical 0.5—1.5 mm thick, obtuse; petals 6—10 mm long, appressedly sericeous-pilose outside, with few hairs on the midrib inside; stamens as many as petals, 5—9 mm long; filament 1.75—2.75 mm long, with a lower portion 1.5—2.25 mm long, 0.05 mm broad, pilose inside at the apex and along the margins, sparingly hairy outside, and an upper portion 0.25—0.5 mm long, glabrous; anther 3.75—6.75 mm long, 0.75 mm broad, with glabrous connective; style with few soft hairs in longitudinal stripes, 3—7 mm long, 0.25—0.5 mm thick; stigma 3.5 mm long, entirely split into 2 acute lobes curved outward, disc 0.25 mm high, 0.75 mm in diameter; ovary one-celled. *Fruit* in the dry state oviformous-ellipsoidal, acute at the base, more acute at the apex, 17—18 mm long (incl. the calyx limb), 6.5—7 mm broad, 6—6.5 mm thick, glabrous or hairy, with 10 very superficial ribs, crowned by the permanent and slightly enlarged calyx limb 1 mm long 1.75 mm wide, with lobes 1.5 mm long and connivate. (Description after the materials mentioned below). **Cfr. fig. 3, i—l.**

Though, by the bifid stigma, this species belongs to the allies of *A. villosum,* it is strikingly different from it by its large calyx lobes and appressed, almost setose indumentum.

Alangium Warburgianum WANGERIN, in ENGL., Pflanzenr., IV, 220b, p. 18 (1910).
MOLUCCAS. Batjan, G. Sibéla, 750—1200 m alt., WARBURG 18116 (BD, type).

Section IV. *Stamens as many as petals and calyx teeth. Style subcylindrical or gradually thicker from the base to the apex, stigma obtuse-conical with 4 longitudinal stigmatose stripes. Endosperm smooth. Radicle much shorter than half the length of the cotyledons.* Species 12—15. **Fig. 4 & 5.** — Twigs monopodial, branching from the axils of the last (sp. 13—15) or the former (sp. 12) vegetation period. Leaves entirely penninervous (sp. 13—15) or palminervous at the base (sp. 12), nearly symmetrical, roundish (spec. 12) to obovate-lanceolate (sp. 13—15). Inflorescence either sessile, with few long primary branches and the further branches and pedicels very short, or with only one branch and in that case apparently long-peduncled. Bracts more (sp. 14—15) or

less (sp. 12—13) developed. Ovary one-celled. Fruit and seed strongly flattened.

12. Alangium nobile (Clarke) Harms — *Internodes* between the adult leaves 1—3.8 cm long, 4—8 mm thick, densely hirsute-tomentose. *Petiole* 14—50 mm long, densely hirsute-tomentose; lamina usually roundly-obovate to oblong-obovate, little asymmetrical, 5—30 cm long, 4—16.5 cm broad, rounded to cordate at the base, usually rounded to obtuse at the apex, more rarely acute or shortly acuminate, its upper

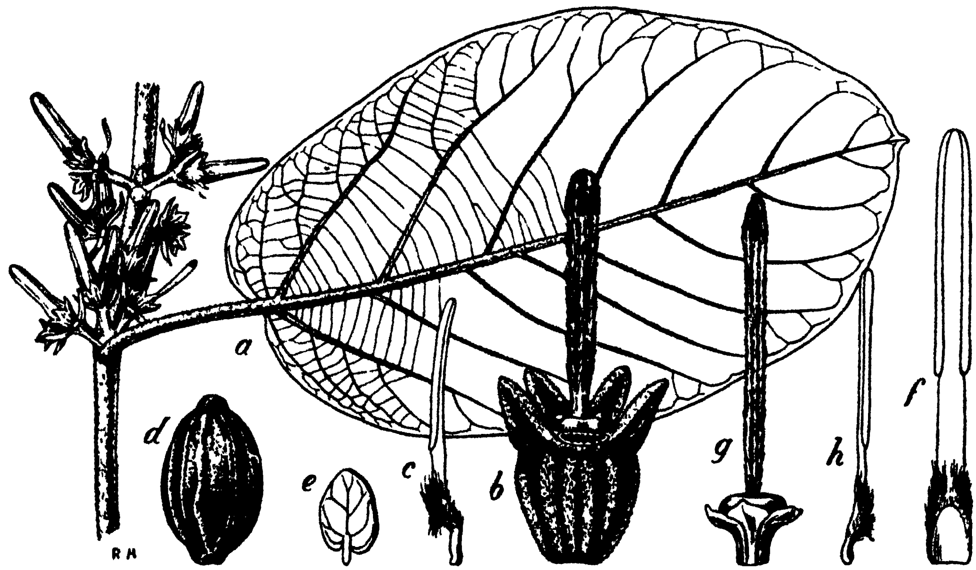

Fig. 4: *Alangium* sect. IV. **a—e**: *A. nobile*; **a**: twig fragment with leaf and inflorescence, $^3/_5$ ×; **b**: calyx with pistill, one calyx teeth cut away, $2^1/_2$ ×; **c**: stamen, $2^1/_2$ ×; **d**: fruit, $^3/_5$ ×; **e**: embryo, $^3/_5$ ×; **f**: *A. nobile* var. *denudatum*, stamen, $2^1/_2$ ×; **g—h**: *A. Havilandii*; **g**: calyx with pistill, $2^1/_2$ ×; **h**: stamen, $2^1/_2$ ×; **a, b, c, d, e**, after Long 3047, **f** after Beguin 582, **g, h**, after Haviland 3019.

surface appressedly hirsute-tomentose on the midrib, glabrous for the rest, its lower surface hirsute-tomentose on the thicker nerves, with more scattered spreading hairs on the finer nerves and veins, coriaceous, 3—9-plinervous at the base, moreover with 7—11 lateral nerves at each side of the midrib. *Inflorescence* densely and thickly hirsute-tomentose, 1—2 × branched, 3—19-flowered, 1.6—4 cm long, with a common peduncle or, in absence of such, with primary branches 2—30 mm long; pedicels 0—2 mm long; bracts triangular, 0.75—5 mm long, 1.25—2 mm broad. *Flowers* 6—7- usually 7-merous, 15—22.5 mm long; calyx densely hirsute-tomentose, almost woolly; tube campanulate 2—2.5 mm long, limb cupuli-

formous 1.5—1.75 mm long and 4—6 mm wide, with teeth 1.5—3.25 mm long; corolla in bud subcylindrical 3—4 mm thick, swollen 4—6.5 mm thick in the basal portion, slightly swollen in the middle of the upper one-half; petals 13—20 mm long, rather densely hirsute-tomentose outside, also densely shortly hairy inside in the upper one-half of the dilate portion and on the midrib; stamens as many as petals, 12—19 mm long; filament 4—7 mm long, with a lower portion 2.5—5 mm long, 1—1.5 mm broad, thickened and bearded at the top inside, tomentose along the margins and on the back, and an upper portion 1.5—3.5 mm long, 0.75 mm broad, glabrous; anther 8—13 mm long, 0.75 mm broad, with glabrous connective; style entirely pilose, 7—12 mm long, nearly 1.2 mm thick at the base, 1.75—2 mm at the apex; stigma conical, 3.75 mm long, 1.75—2 mm broad at the base; disc 6—7-lobed, 1.5 mm high, 5.75 mm in diameter; ovary one-celled. *Fruit* in the dry state ellipsoidal-oviformous, flattened, acute at the base, more acute towards the apex, 26—32 mm long (calyx included), 15—20 mm broad, 10—16 mm thick, tomentose, more or less deeply grooved with 12—14 grooves, crowned by the persistent calyx limb with connivate teeth and the nonexserted disc. (Description after all the materials mentioned below, with exception of the var. *denudatum* and the Borneo specimens). **Cfr. fig. 4, a—f.**

According to notes on the herbarium labels *A. nobile* is a tree 20—30 m high, with a bole 40—90 cm in diameter in the lower portion. The flowers are fragrant, the corolla white or brownish-white, the stamens white, the pollen yellow, style and stigma light-yellowish-brown. The species occurs at altitudes from 75 to 330 m and flowers from March to May.

Marlea nobilis CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 743 (1879); SERTOR., in Bull. Herb. Boiss., 1, p. 474—615 (1893); RIDLEY, in Agr. Bull. Straits & Fed. Mal. St., 1, p. 181 (1902); in Bull. Kon. Mus. Haarlem, 27, p. 72 (1903); *Karangolum nobile* KUNTZE, Rev. gen. pl,. 1, p. 273 (1891); *Alangium nobile* HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KING, in Journ. As. Soc. Beng., 71, II, p. 79 (1902); WANGERIN, in ENGL., Jahrb., 38, Beibl. 86, p. 61—68 (1906); in ENGL., Pflanzenr., IV, 220b, p. 11 (1910); HEYNE, Nutt. pl. Ned. Ind., ed. 1, 3, p. 402 (1917); RIDLEY, Fl. Mal. Pen., 1, p. 892 (1922); HEYNE, Nutt. pl. Ned. Ind., ed. 2, 2, p. 1217 (1927).

Var. **denudatum** BLOEMB., nov.var. — *Ramuli,* petioli, nervorum facies inferior et inflorescentiae tenuiter breviterque tomentosi. Internodia inter folia adulta 2.5—6 mm crassa; petiolus 5—10 mm longus; lamina 4.2—14 cm longa, 2.2—6.2 cm lata, basi 5—7-plinervis, superea nervis lateralibus 9—11 utrinque. Flos 27 mm longus; calycis dentes c. 1 mm longi; stamen 21.75 mm longum, filamento 10.25 mm longo, parte inferiore 4.5—5 mm longa, 1.25—2.25 mm lata, latere interiore apice barbata,

latere exteriore dense pilosa, et parte superiore 5—6 mm longa, 1—1.5 mm lata, glabra. Fructus ignotus.

The var. *denudatum* is, on one hand, too little different from *A. nobile* to base a new species on it, the more as the fruit are unknown. On the other hand it is too much different to be taken up in the description of the species, as the latter is intended to express the characters of a rather rich and very uniformous material. These differences are a more scanty indumentum, longer flowers, and stronger developed filaments which show a larger difference between the lower and the upper portion than any other *Alangium*. For the same reason the characters of the Borneo specimens (BECCARI P.B. 2477, 2927, & 3611) are not taken up in the description. Especially the number BECCARI 2477 is aberrant by thinner twigs, more chartaceous laminae, and a much more scanty indumentum. The general appearance, the fruit entirely agreeing with that of *A. nobile*, and the other BECCARI numbers from Borneo being more or less intermediate between the number 2477 and normal *A. nobile*, kept me back from distinguishing the latter number as a variety or uniting it with the var. *denudatum*, with which it certainly shows resemblance.

MALAY PENINSULA. Penang: road to Highlands, 300 m alt., CURTIS 1505 (S); Perak: Ulu Kal, 150—210 m alt., KING's coll. 10892 (BM, K, L); Larut, Gopeng, 150—240 m alt., KING's coll. (KUNSTLER) 6116 (B, BD, K), KING's coll. 6047 (K); Selangor: Sg. Buloh Reserve, LONG 3047 (S, K), v.n.: *kalong*; Malacca: GRIFFITH s.n. (BM, K); GRIFFITH (Kew distr.) 3384 (BD, K), 3385 (BD, BM, K), first and second no. cited by CLARKE; MAINGAY 707 (L), third no. cited by CLARKE; Selandor, ALVINS 356 (S), v.n. *pokô sutubal*; Leman, GRIFFITH s.n. (K); Singapore: MAINGAY 705 (BD, L), 4th no. cited by CLARKE; Bukit Timah, GOODENOUGH 5077 (BM, S).

SUMATRA. Palembang: Lematang Hilir, near G. Megang, 75 m alt., BOSCHPR.T. 3. P. 864 (B, L), v.n.: *medang mata oedang*.

BORNEO. Sarawak: BECCARI P.B. 2477 (K), 2927 (K), 3611(K).

Distribution of the var. *denudatum*:

SUMATRA, Bengkalis, Sg. Misigit, 6 m alt., in marshy wood, BEGUIN 582 (B, type, L, U, cotypes), v.n.: *mara lepang*, tree 33 m high, with a trunk 22 m high about 40 cm thick, with stilt roots 2.20 m high, spreading 1.20 m, branches obliquely upward, and cream-white flowers with hyacinth odour, collected flowering in January.

13. **Alangium Havilandii** BLOEMBERGEN, n.sp. — *Internodia* inter folia adulta 0.6—3 cm longa, 1.2—3 mm crassa, tenuiter sed densissime tomentosa. *Petiolus* 5—12 mm longus, tenuiter sed densissime tomentosus; lamina elliptica vel oblonga vel nonnihil ovata, leviter asymmetrica, 5.5—15 cm longa, 3—7 cm lata, basi rotundata vel cuneata, longiuscule acuminata versus apicem obtusum vel acutum, glabra vel nervis facie inferiore tenuiter tomentosis, chartacea, nervis lateralibus utrinque 7—9. *Inflorescentia* tenuiter sed dessissime tomentosa, 1—2 × ramosa, 1—6-flora, pedunculo, vel eo absente, ramis primariis 6—14 mm longis, pedicellis 1.5—3 mm longis; bracteae triangulares 0.5—4 mm longae, 0.5—1 mm latae. *Flores* 4—5-meres, 18—22 mm longi; calyx tenuiter sed densissime tomentosus, tubo campanulato-infundibuliformi, 2 mm longo, limbo cupuliformi 1 mm longo 4 mm lato dentibus 0.75 mm longis;

corolla statu alabastri subcylindracea, 1.5—2.5 mm crassa, parte basali valde inflata ad 5.5 mm diametro; petala 16—20 mm longa, tenuiter sed densissime tomentosa latere exteriore, latere interiore tomentosa in parte basali dilatata (praecipue nervo mediano) et ceterum in nervis 3 parallelis prominentibus; stamina 14—17.5 mm longa, filamentis 6—8 mm longis parte basali 2.5—4.5 mm longa 0 5—1.75 mm lata intus apice barbata, dorso omnino vel marginibus pilosa, et parte superiore 2.5—4 mm longa 0.75 mm lata, glabra, anthera 8.7—9.7 mm longa, 1—1.2 mm lata, obtusa, connectivo glabro; stilus omnis pilosus, 11.5—13 mm longus, basi c. 0.5 mm, apice c. 1.5 mm crassa; stigma conicum, 2.5—3 mm longum, basi 1.5—2 mm diametro; discus 4—5-lobus, 1.2—1.25 mm altus, 2.75—3.5 mm diametro; ovarium uniloculare. *Fructus* ignotus. (Description after all the materials mentioned below). **Cfr. ic. 4, g—h.**

By the characters of the flowers this species is closely allied to *A. nobile,* but it is strongly different by leaves quite different-shaped and entirely penninervous, and the peculiar thin but very dense tomentum. Through the penninervous leaves it comes close to *A. Ridleyi* and *A. javanicum.*

BORNEO. Sarawak: G. Sedilu forest reserve (Sadong), OMAR 00054 (S, type), v.n.: *sisit;* Oya, HAVILAND 3019 (BM, K, S); Baram, HAVILAND & HOSE 3285 (K, Sa).

14. Alangium Ridleyi KING — *Internodes* between the adult leaves 1.8—7.5 cm long, 3—9 mm thick, glabrous. *Petiole* 15—40 mm long, glabrous; lamina obovate-oblong or oblong, rarely broader or more ovate, symmetrical, 8—42 cm long, 5—20 cm broad, rounded to cuneate at the base, more or less (never strongly) acuminate towards the obtuse or acute apex, glabrous, rather thickly coriaceous, penninervous with 10—18 lateral nerves at each side of the midrib. *Inflorescence* glabrous, 1—3 × branched, 6—15-flowered, 4.5—22 mm long (flowers excluded), with a common peduncle or, in absence of such, with primary branches 1.5—6 mm long, 3—4 mm thick, and pedicels 1.5—5 mm long; bracts triangular, 0.5—2 mm long, 0.25—0.5 mm broad. *Flowers* 5—7-, usually 6-merous, 18—27 mm long; calyx glabrous; tube infundibuliformous, 3—4 mm long, limb cupuliformous, 2 mm long, 7 mm wide, teeth 0.25 mm long; corolla in bud subcylindrical (in the herbarium 5—7-angular), 4—7 mm thick, obtuse, hardly swollen in the basal portion; petals 15—23 mm long, glabrous outside, inside from 5—6 mm above the base up to the apex appressedly pilose especially on the nerves; stamens 12—20 mm long, filament 3.5—5 mm long, 2—2.75 mm broad, flattened, glabrous outside, bearded at the apex and sparingly hairy along the margins inside; anther 9—14 mm long, 1.5—1.65 mm broad, with glabrous connective; style

pilose on longitudinal stripes, 7.5—12.5 mm long, nearly 1.25 mm thick at the base, 3.75 mm thick below the stigma; stigma conical, 4.5 mm long, 4 mm broad at the base; disc 5—7-lobed, 2.25 mm high, 4 mm in diameter; ovary one-celled. *Fruit* in the dry state ovate, flattened, rounded or slightly acute at the base, more acute towards the apex, 27—37 mm long (calyx included), 18—22 mm broad, 12—14 mm thick, usually glabrous, with 10—14 obtuse ribs and deep grooves between them, crowned by the 2—3.5 mm long calyx limb and the non-exserted disc, in alcohol materials ellipsoidal, not ovate nor flattened, rounded at the base and at the apex, 32—34 mm long, 18—23 mm in diameter, with more superficial grooves. (Description after all the materials mentioned, the alcohol materials being from tree VII. H. 14 cultivated in the Buitenzorg Botanic Garden). **Cfr. fig. 5, a—i.**

According to notes on herbarium labels *A. Ridleyi* is a tree 16—40 m high, with a bole 25—45 cm in diameter, often with flat and curved stilt-roots 50—160 m high, and with spreading branches. The flowers are very sweet scented, white- or cream-coloured, the filaments and style white, the anthers light-yellow, the stigma orange, the disc yellow, the ripe fruit dark-violet to black, red inside. It occurs from 50 to 200 m altitude, in forests, often in marshy forests, and flowers from April to September (dry season).

A. Ridleyi is closely related to *A. javanicum,* but it seems possible to distinguish it by the form and dimensions of the fruit, which in *A. Ridleyi* is 27—37 mm long, 18—22 mm broad, and 12—14 mm thick, strongly grooved with 10—14 deep grooves and obtuse ribs, in *A. javanicum* 17—35 mm long, 11—17.5 mm broad, 6—12 mm thick, usually not at all, sometimes superficially and irregularly, rarely more strongly grooved with 10—12 obtuse ribs. The fruit of *A. Ridleyi* is always less flattened as that of *A. javanicum.* Moreover there are slight differences in the dimensions of the twigs and the flowers. In *A. Ridleyi* the twigs between the adult leaves are 3—9 mm thick, the flowers are 18—27 mm long and 4—7 mm thick in bud; in *A. javanicum* the twigs between the adult leaves are 1.5—6.5 mm thick, the flowers are 8—25 mm long, and 1.75—5 mm thick in bud. These differences are, however, certainly insufficient for specific distinction. As, moreover, among the materials of *A. javanicum* examined, there are specimens with fruit approaching those of *A. Ridleyi* (ELMER 21750, 21116, BEGUIN 2262, JAHERI s.n.) it is doubtful whether *A. Ridleyi,* too, is not a form of the widely spread and polymorphic *A. javanicum.*

Alangium Ridleyi KING, in Journ. As. Soc. Beng., 71, II, p. 78 (1902);

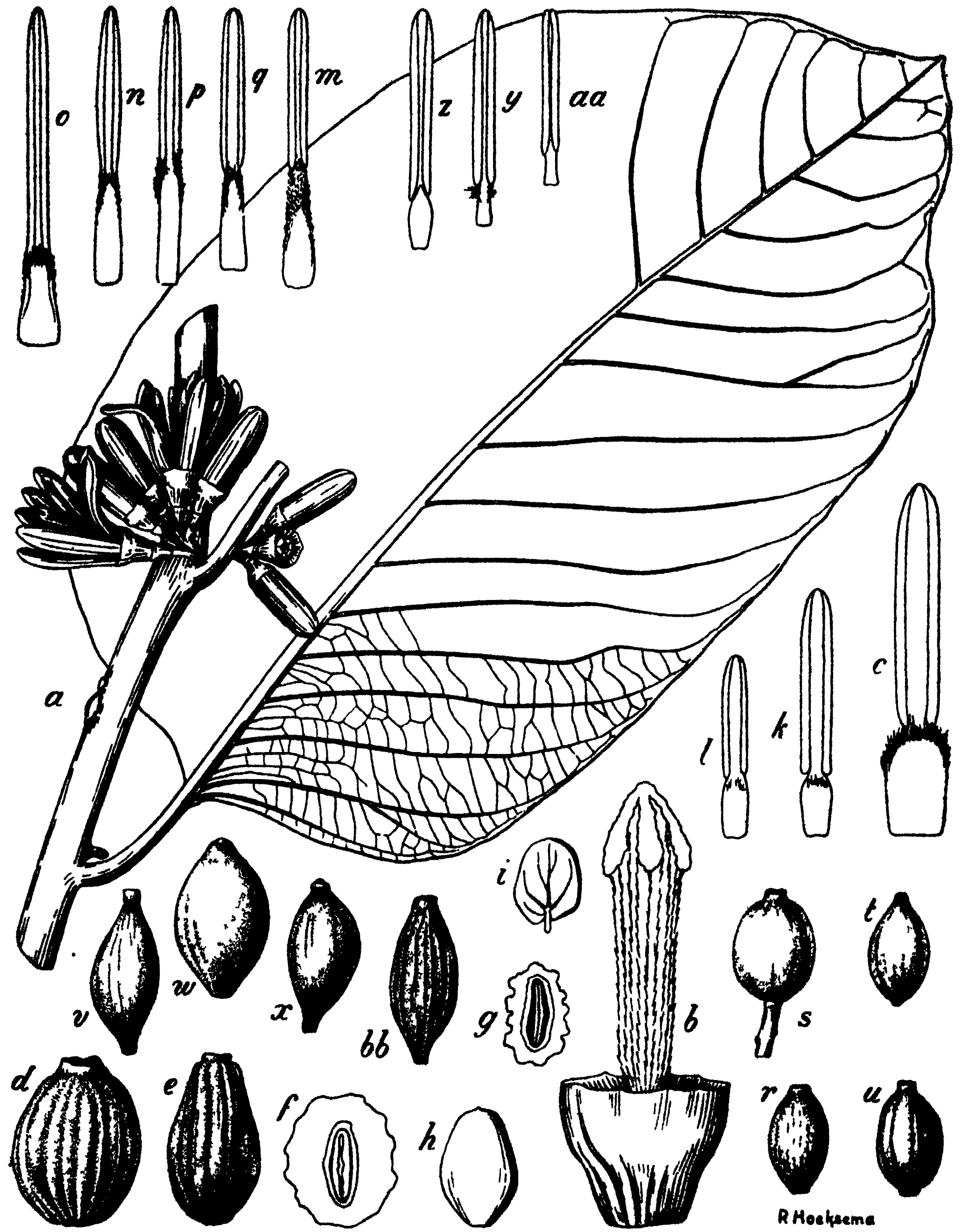

Fig. 5: *Alangium* sect. IV. **a—i**: *A. Ridleyi*; **a**: twig fragment with leaf and inflorescence, $^2/_5$ ×; **b**: calyx with pistill, $2^1/_2$ ×; **c**: stamen, $2^1/_2$ ×; **d**: fruit, alcohol material, $^2/_5$ ×; **e**: fruit, dry, $^2/_5$ ×; **f**: fruit, alcohol material, $^2/_5$ ×; **g**: fruit, dry, $^2/_5$ ×; **h**: stone, alcohol material, $^2/_5$ ×; **i**: embryo, alcohol material, $^2/_5$ ×; **k—v**: *A. javanicum*; **k—q**: stamens, $2^1/_2$ ×; **r—v**: fruit, $^2/_5$ ×, only **s** alcohol material; **w—x**: *A. javanicum* var. *minahassicum*; **w**: fruit, alcohol material, $^2/_5$ ×; **x**: fruit, dry, $^2/_5$ ×; **y—aa**: *A. javanicum* var. *papuanum*, stamens, $2^1/_2$ ×;

Wanger., in Engl., Pflanzenr., IV, 220b, p. 12 (1910); Ridl., Fl. Mal. Pen., 1, p. 893, ic. 75 (1922); Dispers. of pl., p. 350, 376 (1930); *Marlea costata* (non Boerl., 1890), Valet., in Ic. bogor., 3, p. 267, t. 179 (1906); Boldingh, Cat. Herb. Hort. Bogor., p. 145 (1914); *Alangium costatum* Wanger., in Engl., Pflanzenr., IV, 220b, p. 12, ic. 3, A—E (1910); Evrard, in Lec., Fl. Indo-Ch., 2, p. 1186 (1923); Thoenaar, in Meded. Proefst. Boschw., 16, p. 102 (1926); Dakkus, in Bull. Jard. Bot. Buitenz., ser. III, suppl. 1, p. 13 (1930).

Malay Peninsula. Wellesley: Tasek Gelugor, Curtis 3736 (K, S); Perak: Upper Perak, Wray 3632 (K); Pahang: Benus Valley, Bentong, 180 m alt., Burkill & Haniff 16450 (K, S); Tembeling, low el., Henderson 21889 (S); Selangor: Kepong, Sow & Tachoi 16425 (S); Malacca: Selandor, Alvins s.n. (S), v.n.: *kayu lidah karbâu puteh*; Singapore: Cantley's coll. s.n.; Botanic Garden jungle, Ridley 4941 (BM, K, S) type of *Alangium Ridleyi* King; *ibidem*, sine coll. nec no. (BD).

Simeuloeë. Achmad 372 (B, L), v.n.: *medang sengeh*; 532 (B), v.n.: *teramajang silai*; 1271 (B, L), v.n.: *kengengit fatoeh*; 1297 (B, L, U), v.n.: *teramajang pajo*; 1428 (B, L, U), v.n.: *temarajang pajo.*

Sumatra. Simpang Toba (Asahan), 30 m el., Boschpr.bb. 7178 (B), v.n.: *babi koeroes*; Masihi Reserve (Asahan), 40 m el., Boschpr.bb. 6342 (B), v.n.: *babi koeroes*; Bajoenglintjir (Banjoeasin- en Koeboestreken), 15 m el., Boschpr. 160 E. 1. P. 852 (B, L), Boschpr. T. 1159 (B, L), Boschpr. 1. P.T. 797 (B, L), Boschpr. 1. P.T. 789 (B), v.n.: *melepangan pajo*; G. Megang (Lematang Hilir), 75 m el., Boschpr. 131. T. 3. P. 369 (B, L), and 160. E. 3. P. T. 369 (B), v.n.: *medang mata oedang.*

Bangka. Cultivated in the Buitenzorg Botanic Garden from Bangka under VIII. H. 14 & 14a (B, type of *Marlea costata* Valet. non Boerl.) v.n.: *kembel*; under VIII. H. 17 (B, K, L), v.n.: *parak laki*; and under IX. A. 20 & 20a (B).

Also under XI. C. 7a (B) from unknown provenance.

Distribution: Indo-China.

15. **Alangium javanicum** (Blume) Wangerin — *Internodes* between the adult leaves 0.5—6.5 cm long, 1.5—6.5 mm thick, glabrous or thin-tomentose or more rarely shortly hirsute-tomentose. *Petiole* 3.5—28 mm long, with indumentum like the twigs; lamina usually obovate-oblong to obovate-lanceolate, more rarely elliptic to oblong, usually symmetrical, rarely slightly asymmetrical, 2.8—32.5 cm long, 1.3—12.3 cm broad, with rounded to cuneate or somewhat contracted base, more or less acuminate towards the usually obtuse apex, rarely protracted into a long acumen, chartaceous to rather thickly coriaceous, usually entirely glabrous, more rarely shortly hirsute-tomentose or puberulous on the nerves below, or even sparingly hairy between the

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bb: *A. javanicum* var. *Jaherii*, fruit, dry, 1/1 ×; a, Achmad 372, b, c, Boschpr. T. 369, d, e, f, g, h, i, Bot. Gard. Buitenzorg VIII. H. 17, k, Ridley 13223, l, Bot. Gard. Buitenz. VIII. F. 25, m, Bot. Gard. Buitenzorg IX. D. 51, n, Hallier B. 1231, o, Rutten 1832, p, Haviland 2886, q, Agama 1022, r, Hamid 7562, s, t, Boschpr. 31. T. 1. P. 35, u, Hallier B. 1231, v, Kloss 18963, w, x, Bot. Gard. Buitenz. IV. F. 99, y, Ledermann 9818, z, Ledermann 11534, aa, Ledermann 8137, bb, Jaheri s.n.

nerves, entirely penninervous, with 7—22 lateral nerves at each side of the midrib. *Inflorescence* 1—3 × branched, 1—34-flowered, 2—26 mm long (flowers excluded), with a common peduncle or, by lack of this, with primary branches 1—18 mm long, pedicels 0—7 mm long, bracts triangular 0.25—3 mm long, 0.5—2.25 mm broad. *Flowers* 4—7-merous, usually 6-merous, 10.25—19.5(25) mm long; calyx thin-tomentose to glabrous, the tube infundibuliformous or more campanulate, 1.75—3(5) mm long, the limb infundibuliformous or cupuliformous, rarely spreading, 0.9—3 mm long, 3—6 mm wide, with 0.1—0.75 mm long teeth; corolla in bud subcylindrical, 1.75—5 mm thick, usually somewhat swollen in the basal portion, also slightly in the middle of the upper one-half, obtuse or more rarely acute or shortly acuminate; petals 8.5—16.5(20) mm long, thin-tomentose or more rarely glabrous or hirsute-tomentose outside, sparingly hairy inside especially on the nerves, rarely thin-tomentose or quite glabrous; stamens as many as petals, 8—15.75(19) mm long, filament 2—6.75 mm long, 0.75—2 mm broad, bearded inside at the tip and hairy along the margins, glabrous or sparingly tomentose or pilose outside; anther 6—10(12.5) mm long, 0.7—1.25 mm broad, with glabrous connective; style pilose or tomentose on longitudinal stripes, often glabrous in the basal portion, 4—10(16.5) mm long, 0.6—1 mm thick at the base, 1.3—3.2 mm thick below the stigma; stigma conical with 4 longitudinal stigmatose ribs, 1.4—3.25 mm long, 1—2 mm thick at the base; disc semiglobose, 4—7-angular, or 4—7-lobed, rarely cylindrical, 0.8—2.25 mm high, 1.8—4 mm in diameter; ovary one-celled. *Fruit* ellipsoidal, ovate or slightly rhomboid in the dry state, rounded at the base, acute or rarely slightly acuminate towards the apex, 17—30(35) mm long, 11—15 mm broad, 6—12 mm thick, glabrous or thin-tomentose, usually superficially, more rarely deeper-grooved, crowned by the 1—3 mm long, 3—4.5 mm wide calyx limb and the disc that is exserted or not. (Description after the materials mentioned, with exception of the varieties distinguished, the dimensions between brackets being those of the specimens with unusually long flowers discussed below). **Cfr. fig. 5, k—bb.**

Alangium javanicum, as accepted here, is a widely spread and rather polymorphic species, especially varying in the eastern part of its area. Of the varieties only those have been named, that perhaps have a higher systematic value. Of the other variations may be mentioned, that a part of the North-Borneo and Java materials are more hirsute-tomentose with more brownish indumentum, whereas most other forms have a greyish, thin-tomentose indumentum. A number of North-Borneo

specimens, described as *A. mezianum* by WANGERIN (HAVILAND & HOSE 2885) and as *A. borneense* by MERRILL (AGAMA 1022, RAMOS 1451, KLOSS 18963) and those from Séran (RUTTEN 1832), have unusually long flowers. The fruit are rather large in the specimens described as *A. borneense* by MERRILL, being up to 35 mm long, and attenuate not only towards the apex but also towards the base. The specimen CLEMENS 29216 from Mt. Kinabalu is the only one, not only of the species, but also of the whole section, that has glabrous styles. As fruit are lacking the determination is somewhat doubtful.

Styrax javanicum BLUME, Bijdr., 13, p. 671 (1825); A. DE C., in D.C., Prodr., 8, p. 268 (1844); MIQUEL, Fl. Ind. Bat., I, 2, p. 464 (1859); KURZ, in Journ. As. Soc. Beng., 40, II, p. 61 (1871); in Flora, 54, p. 273 (1871); in Nat. Tijschr. Ned. Ind., 34, p. 107 (1874); BOERL., Handl. Fl. Ned. Ind., 2, p. 232 (1891); GRESHOFF, Schetsen, p. 118 (1896); KOORD. & VALET., Bijdr. booms. Java, 7, p. 13 (1900); PERKINS, in ENGL., Pflanzenr., IV, 241, p. 85 (1907); VAN STEENIS, in Bull. Jard. Bot. Buitenz., ser. 3, 12, p. 253 (1932); *Marlea ebenacea* CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 742 (1879); SERTOR., in Bull. Herb. Boiss., 1, p. 473—615 (1893); RIDLEY, in Agr. Bull. Straits & Fed. Mal. St., new ser., 1, p. 181 (1902); *Marlea costata* BOERL., Handl. Fl. Ned. Ind., I, 2, p. 654 (1890) non alior.; *Karangolum ebenaceum* KUNTZE, Rev. gen. pl., 1, p. 273 (1891); *Alangium ebenaceum* HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 262 (1898); KING, in Journ. As. Soc. Beng., 71, II, p. 78 (1902); WANGER., in ENGL., Jahrb., 38, Beibl. 86, p. 63—68 (1906); in ENGL., Pflanzenr., IV, 220b, p. 14 (1910); HEYNE, Nutt. pl. Ned. Ind., ed. 1, 3, p. 402 (1917); ed. 2, 2, p. 1217 (1927); RIDLEY, Fl. Mal. Pen., 1, p. 893 (1922); *Alangium arboreum* GRESHOFF. Meded. 's Lands Plantent., 25, p. 91 (1898) nomen; *Marlea javanica* KOORD. & VALET., Bull. Inst. Bot. Buitenz., 2, p. 2 (1899); Bijdr. booms. Java, 5, p. 76 (1900); KOORD., in Natuurk. Tijdschr. Ned. Ind., 60, p. 380 (1901); BOLDINGH, Cat. pl. Herb. Hort. Bogor., p. 145 (1914); JANSSON., in MOLL & JANSS., Mikrogr., 3, p. 721 (1918); *Nyssa Hollrungii* SCHUMANN, in SCHUM. & LAUTERB., Nachtr. Fl. deutsch. Schutzgeb. Südsee, p. 334 (1905); WANGER., in ENGL., Pflanzenr., IV, 220a, p. 15 (1910); *Alangium meyeri* MERRILL, in Publ. Governm. Labor., 35, p. 54 (1906); in Phil. Journ. Sc., 1, suppl. 1, p. 111 (1906); WANGER., in ENGL., Pflanzenr., IV, 220b, p. 15 (1910); MERRILL, in Phil. Journ. Sc., bot., 7, p. 321 (1912); 21, p. 531 (1922); Enum. Phil. Fl. Pl., 3, p. 241 (1923); MELCHIOR & MANSF., in ENGL., Jahrb., 60, p. 163 (1925); MERRILL, in Univ. Calif. Publ. Bot., 15, p. 232 (1929); *Alangium costatum* WANGER., in ENGL., Jahrb., 38, Beibl. 86, p. 61—83 (1906) nomen; *Alangium Mezianum* WANGER., in ENGL., Jahrb., 38, Beibl. 86, p. 61—65 (1906); in FEDDE, Repert., 4, p. 338 (1907); in ENGL., Pflanzenr., IV, 220b, p. 15, ic. 3, F—J (1910); MERRILL, Journ. Str. branch, Roy. As. Soc., spec. numb. 1921, p. 459 (1921); *Alangium bogoriense* WANGER., in FEDDE, Repert., 4, p. 338 (1907); in ENGL., Pflanzenr., IV, 220b, p. 11 (1910); DAKKUS, in Bull. Jard. Bot. Buitenz., ser. III, suppl. 1, p. 13 (1930); *Alangium javanicum* WANGERIN, in ENGL., Pflanzenr., IV, 220b, p. 14 (1910); KOORD., Exkursionsfl., Java, 2, p. 731, 733 (1912); KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 102 (1912); DAKKUS, in Bull. Jard. Bot. Buitenz., ser. III, suppl. 1, p. 13 (1930); *Alangium tutela* RIDL., in Journ. Roy. As. Soc., Str. Br., 61, p. 10 (1912); Fl. Mal. Pen., 1, p. 894 (1922); *Alangium borneense*

MERRILL, in Journ. As. Soc., Str. Br., 86, p. 342 (1922); *Alangium salviifolium* BAKER, in Journ. of Bot., 62, suppl. p. 45 (1924) pro parte; *Alangium Hollrungii* & *A. papuanum* MELCH. & MANSF., in ENGL., Bot. Jahrb., 60, p. 163, 165 (1925); *Alangium sessiliflorum* MERRILL, in Univ. Calif. Publ. Bot., 15, p. 232 (1929); *Alangium oblongum* CRAIB, in Kew Bull. 1930, p. 426 (1930).

Var. **minahassicum** BLOEMB., nov. var. — Fructus statu sicco 30—34 mm longus, 16—17.5 mm latus, 9—12 mm crassus, in alcohole conservatus ad 35 mm longus, 19 mm latus, 14 mm crassus, disco 2—3 mm alto, calycem 1—1.5 mm altum distincte superans. Flores ignoti. **Cfr. fig. 5, w—x.**

Distribution: Selebes, Minahassa, and Halmahéra.

The fruits from both localities are strikingly similar.

Var. **papuanum** (MELCH. & MANSF.) BLOEMB., nov. var. — Filamenta 1.5—3.1 mm longa, 0.5—1.5 mm lata, omnino glabra vel pilis nonnullis in utroque latere apicis. Flores in statu alabastri tantum noti, 6—17.8 mm longi. **Cfr. ic. 5, y—aa.**

Nyssa Hollrungii SCHUMANN, in SCHUM. & LAUTERB., Nachtr. Fl. deutsch. Schutzgeb. Süds., p. 334 (1905); *Alangium Hollrungii, A. Meyeri, & A. papuanum* MELCH. & MANSF., in ENGL. Bot. Jahrb., 60, p. 163—165 (1925).

Distribution: New Guinea.

Except by the peculiar filaments the New Guinea specimens of *A. javanicum* are characterized by thin twigs with small leaves, but similar forms are found in most different parts of the area, especially in dry regions.

Var. **Jaherii** BLOEMB., nov. var. — Fructus 32—33 mm longi, 13—15 mm lati, 8—9 mm crassi, costis 10—12 crassis obtusis, et sulcis profundis. Flores ignoti. **Cfr. ic. 5, bb**

Distribution: Kai Islands.

The fruit are somewhat similar to those of *A Ridleyi*, but they are shorter and especially narrower an more acute towards both ends.

Distribution of the species:

MALAY PENINSULA. Perak: SCORTECHINI 1963 (BD, L); Tupai, plains, WRAY 3302 (S); Larut, 90—240 m alt., KING's coll. 3252 (B, BD); 150—240 m alt., KING's coll. 5363 (BM, E, K); within 30 m alt., KING's coll. 6626 (K, L); Pahang: Temerloh, Kemansul forest reserve, HAMID 10887 (K, S); Belingor forest reserve AWANG-LELA 4511 (S), v.n.: *petong ka-kura*; Kuantan, BURN MURDOCH s.n. (S); Selangor: Weld's Hill forest reserve, BURN MURDOCH 27 (K); AHMAD 4748 (K, S), v.n.: *medang*; HAMID 562 (S), v.n.: *kelat*; Rantau Panjang, STRUGNELL 12487 (S); Sungei Buloh forest reserve, ABU 3311 (K, S), v.n.: *melidah*; Malacca: GRIFFITH s.n. (BM, K); GRIFFITH (Kew distr.) 3383 (BD, K), first no. cited by CLARKE of *Marlea ebenacea*; MAINGAY (Kew distr.) 706 (K, L), 2nd no. cited by CLARKE of *Marlea ebenacea*; ALVINS 1171 (S), v.n.: *pokô kulat kurantaû*; Tuniang, ALVINS 1695 (S), v.n. *pokô kaiu lida lida*; Merlimau, ALVINS 2161 (S), v.n.: *pokô pachat kuniang*; Selandau, GOODENOUGH 1809 (S), v.n.: *autoi (antoi?)*; Johore: Sungei Tebrau, RIDLEY 13223 (K, S); Panti, BAIN (?), 6006 (K, S), v.n.: *kahwa kahwa*; Singapore: Ponggol, GOODENOUGH (RIDLEY) 5082 (BM, S), v.n.: *kayu tass*, anti-tiger-tree, type of *Alangium tutela* RIDLEY.

SIMEULOEË, ACHMAD 18 (B, L), v.n.: *taramajang*; 1266 (B, L, U), v.n.: *bidara oeding*; Dèfajan, Tapah, ACHMAD 1423 (B, L), v.n.: *taramajang oeding*; 1365 (B, L), v.n.: *bidara pajo*; 1509 (B, L), v.n.: *taramajang boeloh.*

SUMATRA. Without further locality: cultivated in the Buitenzorg Botanic Garden under V.. E. 35 & 35a (B) sub nom. „*Alangium arboreum* T. & B.''; Subdiv. Lower Langkat (Oostkust), near Aloer Goesta, alt. 50 m, BOSCHPR.BB. 16. 630 (B), v.n.: *patimah*; Painan (W. Kust), Kp. Baroeng-baroeng Balantai, BOSCHPR. S.W. K. I. 30 (B), v.n.: *kalek poetih ranting*; Oud-Agam, Sg. Dareh, Kp. Batastjoeli, 1200 m alt., BOSCHPR. S.W.K. II. 30 (B), v.n.: *kalek kopi*; Manindjang, Kp. Silajang, BOSCHPR.BB. 5221 (B, L), v.n.: *bantoenan*; Pariaman, Kp. Tandjoeng, 400 m alt., BOSCHPR.BB. 6722 (B), v.n.: *kali toelang*; Kroë (Bengkoeloe), Kota Bonglai, 900 m alt., BOSCHPR.BB. 10286 (B), v.n.: *giok koendjir*; Palembang, Kapar Litjin, R. Rawas, 450 m alt., FORBES 3173 (BM, K, L), according to BAKER in Journ. Bot., vol. 62, suppl., p. 45 from Moeara Mengkoelem, R. Rawas, 150 m alt.; Banjoe-Asin- & Koeboe-streken, 20 m alt., GRASHOFF 721 (B, L), v.n.: *kajoe nanau*, Bajoenglintjir, 15 m alt., BOSCHPR. 31. T. 1. P. 35 (B, L), v.n.: *kajoe manau*; Lematang Hilir, ENDERT .101 (B, L), v.n.: *kajoe manau*; Lampongs, TEYSMANN 6717 (B), v.n.: *harikoekoen*, and cultivated in the Buitenzorg Botanic Garden, labelled partly „*Alangium arboreum* T. & B." and partly „*Cyclostemon mucronatum* BL." (B, K, L, S), in (L) type of *Marlea costata* BOERL. = *Alangium bogoriense* WANGER.

LINGGA ARCHIPELAGO. P. Lingga, Sg. Dai, TEYSMANN 6664 H.B. (B), v.n.: *boewa tas.*

ANAMBAS & NATOENA ISLANDS. P. Boengoeran, G. Ranai, 200 m el., VAN STEENIS 1263 (B, L, S); 250 m el., VAN STEENIS 1221 (B, U), v.n.: *kajoe kenelan.*

BORNEO. British North Borneo, Mt. Kinabalu, Kundusang, 900 m el., CLEMENS 29216 (B, NY); near Sandakan, Suanlamba River, 10 m el., AGAMA 550 (M), v.n.: *lasit*; Batu Lima, low alt., AGAMA 1022 (B, BD, BM, L, M) type of *Alangium borneense* MERR.; RAMOS 1451 (B, BD, BM, L, M); Batu Lapan, WOOD 2252 (K, UC), type of *Alangium sessiliflorum* MERRILL; Bettottan, KLOSS 18963 (B, S); Tawao, ELMER 21116 (B, BD, K, NY, S, U), 21165, 21176, 21422, 21447, 21750 (B, BD, BM, K, NY, S, U), 21553 (B); Sarawak: Rejang, Kapit, and Rejang, Sitri, KALONG (HAVILAND) 2885 (B, L, S, Sa); West-Borneo: Soengai Sibau, HALLIER B. 1231 (B, L); Koeboe, Kp. Ombawang, 50 m alt., BOSCHPR. W. B. BB. 7141 (B), v.n.: *birong*; East-Borneo: Boengoelan, Kp. Kabiran, 100 m alt., BOSCHPR.BB. 11732 (B), BB. 11749 (B), v.n.: *enkenolan*; West-Koetai, near Keloempang, alt. 40 m, BOSCHPR.BB. 16.932 (B), v.n.: *beremkoelat*. East-Koetai Sankoelirang, Kp. Pendangan, Sg. Bai, 25 m el., BOSCHPR.BB. 12982 (B) v.n.: *ladjik*; Kp. Palawan, 50 m el., BOSCHPR.BB. 11945 (B), v.n.: *toebo*; South-Borneo: Midden-Doesoen, Kp. Penangin, 75 m el., BOSCHPR.BB. 12464 (B), v.n.: *trangolon.*

P. LAOET. Kp. S. Paring, 100 m alt., BOSCHPR.BB. 12381 & 12910 (B), v.n.: *marlapang.*

JAVA. Cultivated in the Buitenzorg Botanic Gardens, from Java, without exact locality, sub VIII. F. 25 & 25a (B), v.n.: *kiparang*; BLUME s.n. (B, NY), originals of *Styrax javanicum* BLUME; Tjiampèa near Buitenzorg, KOORDERS forest no. 402*, herb. no. 30124 β (B, L); for. no. 405*, herb. no. 30599β (B, L); 200—300 m alt., KOORDERS for. no. 484*, herb. no. 30601 β (B), for. no. 485*, herb. no. 30600 β (B, L); Sanggrawa, Djampangkoelon near Soekaboemi, 400 m el., KOORDERS 6079 β (B, BD, K, L).

SELEBES. Subdivision Boalemo (= Tilamoeta), near Kampong Popaja, alt. 300 m, BOSCHPR.BB. 15.699 (B), v.n.: *tintbotoe*; subdiv. Donggala, near Kampong Bambamate, alt. 150 m, BOSCHPR.BB. 17.056 (B), v.n.: *lokoe*; subdiv. Malili, near Kampong Kawata, BOSCHPR. Cel. V. 199 (B), v.n.: *lansabonti poete*.

TALIABOE. Waekoejoe, ATJè (Exp. HULSTIJN) 255 (B, L).

MOLUCCAS. Without exact locality, cultivated in the Buitenzorg Botanic Garden under IX. D. 51 (B); island Kasiroeta (= Groot Tawali), near Dinga, alt. 10 m, BOSCHPR.BB. 16.440 (B), v.n.: *soa-soa maki;* island Batjan, near Geti, alt. 15 m, BOSCHPR.BB. 16.450 (B), v.n.: *koko & beo*; island Séran, Wai Kawa 100—200 m alt., RUTTEN 1832 (B, L); island Ambon, near Soeli, alt. 70 m, BOSCHPR.BB. 18.104 (B), v.n.: *samar*.

Further distribution of the species: Siam.

Distribution of the var. *minahassicum*:

SELEBES. In the Buitenzorg Botanic Garden under IV. F 99 (B, L), coll. by BOERLAGE, VALETON & KOORDERS (20844β), cultivated from fruit collected by KOORDERS near Manado.

HALMAHERA. West Pitoe, 80 m el., BEGUIN 2262 (B, L).

Distribution of the var. *Jaherii*:

KAI ISLANDS. JAHERI s.n. (B).

Distribution of the var. *papuanum*:

NEW GUINEA. N. E. Part.: April River, Bivouac 18, 15—20 m el., LEDERMANN 9795 (BD); 200—400 m el., LEDERMANN 9818 (BD), 9829 (BD); Augusta River, 2nd station, HOLLRUNG 720 (BD); Augusta River, Malu, Ficus Ridge, 100—200 m el., LEDERMANN 10851 (BD), 20—30 el., LEDERMANN 11534 (BD); Bani-Schlucht, 50—100 m el., LEDERMANN 8137 (BD).

16. Alangium maliliense BLOEMBERGEN, n. sp. — *Internodia* inter folia adulta 1—3.5 cm longa, 1.5—5 mm crassa, pilis ramosis velutino-tomentosa. *Petiolus* 4—8 mm longus, velutino-tomentosus; lamina circuitu rotundato-elliptica ad oblonga, saepe paulum ovata, basi rotundata vel leviter cordata, subsymmetrica, 4.5—9.5 cm longa, 3—4.5 cm lata, apicem obtusum versus plerumque abrupte brevissime acuminata, facie superiore glabra, facie inferiore nervis pilis stellatis subhirsuto-velutinis, inter nervos pilis stellatis semitecta, omnino penninervis, chartacea vel tenuiter coriacea, nervis lateralibus 8—15 utrinque. *Inflorescentiae* omnino velutino- vel subhirsuto-tomentosae, 1—2 × ramosae, 1—5-florae, 5—14 mm longae (floribus exclusis), pedunculo vel eo absente ramis primariis 4—12 mm longis, pedicellis 2—8 mm longis; bracteae triangulares, 0.75—2 mm longae, 0.5—1.5 mm latae. *Flores* 6—7-meres, plerumque 7-meres, circiter 17—21 mm longi; calyx eodem indumento ac inflorescentia, subinfundibuliformis, 3 mm longus, limbo subcupuliformi 0.75 mm longo circiter 5 mm lato, dentibus triangularibus 0.5—1 mm longis; corolla statu alabastri adulti subcylindracea 4 mm lata, supra basin ad 5—5.5 mm inflata, apice obtusissima; petala 14—17.5 mm longa, facie exteriore pilis ramosis densissime hirsuto-velutina, facie interiore parte basali excepta adpresse pilosa; stamina aequo numero

ac petala, 13—17 mm longa; filamentum 4—5.5 mm longum, basi apiceque c. 1 mm, medio fere 2 mm latum, facie interiore apice valde incrassatum, dorso densiuscule puberulo, marginibus apicem versus et incrassatione pilis longiusculis densissime velutino-barbatis, anthera 9—11.5 mm longa, connectivo glabro; stylus subcylindraceus, stigma versus paulum attenuatus, 8—10.5 mm longus, medio 1.25—1.5 mm crassus, densissime adpresse pilosus; stigma obtuse conicum, 2 mm longum, basi 1—1.25 mm latum; discus 6—7-lobus, 0.5—0.75 mm altus, 2.75—3 mm diametro; ovarium uniloculare. *Fructus* statu sicco ellipsoides, leviter compressus, basi rotundatus vel breve conicus, apice rotundatus, 23—27 mm longus (calyce incluso), 12—14 mm latus, 9—11 mm crassus, pilis stellatis et ramosis densissime hirsuto-velutinus, costis numerosis obtusis passim reticulatis, apice calycis limbo persistente et disco non exserto coronatus.

By the form of the stigma and the structure of the inflorescence this new species certainly belongs to the 4th section. With *A. nobile* it agrees in the velvety-hirsute indumentum, the leaf-shape and the strongly reticulate nervation on the underside of the lamina. The lamina is, however, entirely penninervous, as in *A. Havilandii, A. Ridleyi* and *A. javanicum.* With *A. Ridleyi* and *A. javanicum* it agrees by the filaments not having a narrower upper portion, with *A. javanicum* by the mode of ramification of the twigs. The fruit reminds of that of *A. nobile* and *A. Ridleyi* as to the form. Besides by the combination of characters in general, *A. maliliense* is characterized by the ochraceous colour of its indumentum and the strongly developed thickening at the top of the filaments inside.

SELEBES. Subdivision Malili, near Kampong Kawata, alt. 300 m, BOSCHPR. Cel. V. 161 (B), tree 30 m, trunk 20 m tall, 64 cm diameter, flowers white, with aromatic odour, fruit yellowish brown or yellow-orange, without odour, sweet and sour; v.n.: *moroipo*; collected thrice from the same tree, Sept. 27, 1932, with flower (WATURANDANG 43), Nov. 19, 1932, with fruit (WATURANDANG 158), and Dec. 21, 1932, with fruit (WEISMANN 210).

The last species has been added afterwards when the manuscript had already been sent to the printer. This is the cause why it has not been taken up in the determination keys and in the general discussions.

Doubtful form.

Marlea tomentosa var. **dentata** KOORDERS & VALETON — Whereas the varieties *genuina* and *rotundifolia* of *Marlea tomentosa,* as given by KOORDERS and VALETON, are accepted as distinct species in this paper, the var. *dentata* of the same species has remained a doubtful form. It is hardly doubtful whether these form will later prove to be a form of one of the former varieties, distinguished here as *A. Kursii* and *A. rotundifolium,* but the herbarium materials examined are scanty, and only one of the 3 numbers has few flowers and none has any fruit. Moreover

all seem to be youth forms, as is evident from the large laminae (8—26 by 5—24 cm) with 3 apices. The indumentum reminds of *A. rotundifolium* as to its nature; the long flowers (23—30.5 mm long, according to KOORDERS & VALETON even to 32 mm long) remind of *A. Kurzii*; for these long flowers the filaments are remarkably short, viz. 3—5 mm.

The specimens examined are:

West-Java, G. Tiloe near Pengalengan, 1580 m el., KOORDERS 1304β & 1305β (B), v.n.: *kitjaruh*, youth form, corolla, filaments & style white, anther yellow; forest Tjigenteng (Tjisondari), KOORDERS 1310β (B, L), v.n.: *kitjareh*, youth form.

Species wrongly recorded for the area.

Alangium decapetalum, recorded for the Malay Archipelago by MIQUEL (Fl. Ind. Bat., I, 1, p. 744) and by KURZ for Bangka (Nat. Tijdschr. Ned. Ind., 27, p. 169), and *A. salviifolium* ssp. *decapetalum*, recorded with doubt for Java by KOORDERS (Exkursionsfl. Java, 2, p. 773) do not occur in the area dealt with in this paper.

Species reiciendae.

Alangium celebicum KOORDERS, in Meded. 's Lands Plantent., 19, p. 623 (Versl. dienstr. Minahassa, p. 492) (1898); WANGERIN, in ENGL., Pflanzenr., IV, 220b, p. 24 (1910); KOORD.-SCHUM., Syst. Verz., 2, fam. 229, p. 100 (1914).

As is evident from originals in the Buitenzorg, Leiden and Kew herbaria, named by KOORDERS as *Alangium celebicum* [KOORDERS, forest number 2517* with herb. no. 19627β; (B, L), and forest number 2455* with herb. no. 16873β (B, L), and RIEDEL s.n. (K)], this is not an *Alangium* at all, but I could not trace its right name.

Alangium kinabaluense W. W. SMITH, in Notes Bot. Gard. Edinb., 8, p. 315 (1915); MERRILL, in Journ. Str. Br. Roy. As. Soc., spec. numb. 1921, p. 459 (1921).

This species, based upon a specimen from Mt. Kinabalu, native coll. 49 (E, K), is **Polyosma Hookeri** STAPF, in HOOKER, Icon. plant., 23, t. 2296 (1894).

LIST OF COLLECTORS' NUMBERS,

with reference to the species by means of their number.

ABU 2297 = 8; 3311 = 15; 6505 = 8.

ACHMAD 18 = 15; 339 = 1; 372 = 14; 1271 = 14; 1266 = 15; 1297 = 14; 1365 = 15; 1423 = 15; 1428 = 14; 1509 = 15.

AGAMA 560 = 15; 1022 = 15.

AHMAD 4748 = 15.

AJOEB (Exp. JACOBSON) 180 = 5; 370 = 7; 445 = 1.

ALVINS s.n. = 14; 356 = 12; 1171 = 15; 1695 = 15; 2161 = 15.

AMDJAH 807 = 8.

ATJè (Exp. HULSTIJN) 255 = 15.

AWANG-LELA 4511 = 15.

BACKER 2829 = 4; 3529 = 4; 7975 = 4; 12214 = 5; 12324 = 5; 14187 = 5; 16604 = 1; 17546 = 1; 17764 = 1; 22538 = 5; 25231 = 4; 25396 = 4; 25721 = 5; 30578 = 4; 32021 = 1.

BAIN (?) 6006 = 15.

BAKHUIZEN VAN DEN BRINK 1561 = 5; 7718 = 5.

BARTLETT 8703 = 6.

BECCARI P. S. 68 = 5; P. S. 226 = 5; P. S. 611 = 5; P. B. 2477 = 12; P. B. 2927 = 12; P. B. 3611 = 12.

BECKING 56 = 9.

BEGUIN 582 = 12; 1977 = 8; 2262 = 15.

BLUME s.n. = 4 (2 ×), 6 (2 ×), 9, 15.

BOSCHPROEFSTATION (Forest Experiment Station)

BB-NUMBERS: 4006 = 6 4922 = 6; 5221 = 15; 5340 = 6; 5414 = 4; 5646 = 6; 6342 = 14; 6722 = 15; 6816 = 5; 7178 = 14; 7202 = 5; 7289 = 5; 8632 = 5; 9730 = 6; 9737 = 6; 10286 = 15; 11370 = 9; 11732 = 15; 11749 = 15; 11945 = 15; 12220 = 5; 12381 = 15; 12464 = 15; 12910 = 15; 12982 = 15; 14.352 = 9; 15.699 = 15; 15.729 = 5; 16.440 = 15; 16.450 = 15; 16.630 = 15; 16.932 = 15; 17.056 = 15; 18.104 = 15.

OTHER NUMBERS: Cel. V. 128 = 8; Cel. V. 161 = 16; Cel. V. 199 = 15; E. 1218 = 6; Ja 1728 = 5; S. W. K. I. 30 = 15; S. W. K. II. 30 = 15; T. 52 = 3; T. 1159 = 14; T. 3. P. 864 = 12; W. B. bb. 7141 = 15; 1. P. T. 789 = 14; 1. P. T. 797 = 14; 31. T. 1. P. 35 = 15; 131. T. 3. P. 369 = 14; 160. E. 3. P. T. 369 = 14; 160. E. 1. P. 852 = 14.

BOSSCHA s.n. = 5.

BOTANIC GARDEN, BUITENZORG III. G. 60 & 60a = 1; IV. F. 99 = 15; VII. E. 35 & 35a = 15; VIII. F. 25 & 25a = 15; VIII. H. 14 & 14a = 14; VIII. H. 17 = 14; IX. A. 20 & 20a = 14; IX. A. 22a = 1; IX. D. 51 = 15; XI. C. 7a = 14; XII. B. 207 & 207a = 1; XII. B. 201a = 1; XVII. C 133a = 1; XVII. C. 135 = 1; XVII. C. 136 & 136a = 1.

BOTANIC GARDEN, SIBOLANGIT 80 = 6.

BRASS 1066 = 10.

BUNNEMEIJER 3754 = 6.

BURKILL 907 = 5.

BURKILL & HANIFF 12851 = 5; 16450 = 14; 17069 = 8.

BURN MURDOCH s.n. = 15; 27 = 15; 14152 = 8.

BUSSE 1489a = 1.

BUYSMAN s.n. = 4.

CANTLEY'S COLLECTOR s.n. = 14.

CLASON 989 = 4.

CLEMENS 21049 = 8; 26705 = 5; 29216 = 15; 30527 = 2.

COLFS 180 = 4.

CUBITT'S COLLECTOR 889 = 8.

CURTIS 940 = 6; 1505 = 12; 2689 = 5; 3736 = 14.

DE JONG 38 = 4.

DES AMORIE VAN DER HOEVEN s.n. = 6.

DE VRIESE s.n. = 1.

DOMMERS 82 = 1; 216 = 1.

ELBERT 478 = 4; 4153 = 4; 4179 = 4.

ELMER 21116 = 15; 21165 = 15; 21176 = 15; 21422 = 15; 21447 = 15; 21750 = 15; 21553 = 15.

ENDERT 101 = 15; 4052 = 7; 4076 = 7.

FORBES 1899 = 5; 2739 = 8; 2785 = 6; 2812 = 8; 2813 = 8; 2894 = 1; 3173 = 15.

FOX 122 = 5.
GALOENGI 325 = 6.
GARAI 2018 = 7.
GOODENOUGH 1809 = 15; 5077 = 12; 5082 = 15.
GRASHOFF 721 = 15.
GRIFFITH s.n. = 12 (2 ×), 15; 3383 = 15; 3384 = 12; 3385 = 12; 3387 = 8.
HALLIER B. 1231 = 15; B. 3238 = 3.
HAMID 562 = 15; 10887 = 15.
HASHIM 493 = 8.
HAVILAND 3019 = 13. Cfr. also GARAI, KALONG.
HAVILAND & HOSE 3285 = 13.
HENDERSON 11833 = 5; 20197 = 1; 21889 = 14; 24546 = 8.
HENDERSON & NUR 18554 = 5; 21750 = 5.
HOLLRUNG 720 = 15.
HOLTTUM 9310 = 8.
HORSFIELD s.n. = 1 (2 ×), 4.
HOSSEUS 440 = 8.
HOUTSOORTEN VAN DEN GEDEH 175 = 9.
IBOET 39 = 8.
JAHERI s.n. = 15.
JELINEK (Exp. Novara) s.n. = 6.
JUNGHUHN s.n. = 4, 5 (4 ×), 9 (2 ×).
KALONG 1505 = 2; 2885 = 15.
KERR 1172 = 6.
KING'S COLLECTOR 563 = 8; 3252 = 15; 3329 = 8; 3593 = 8; 5363 = 15; 5590 = 1; 5824 = 8; 6047 = 12; 6116 = 12; 6626 = 15; 8281 = 8; 10183 = 8; 10523 = 8; 10892 = 12.
KLOSS 18963 = 15.
KOORDERS

HERBARIUM NUMBERS, followed by a β: 868 = 4; 869 = 4; 1300 = 5; 1301 = 5; 1302 = 5; 1303 = 4; 1304 = cfr. p. 288; 1305 = cfr. p. 288; 1306 = 5; 1307 = 5; 1308 = 5; 1309 = 5; 1310 = cfr. p. 288; 3766 = 9; 3767 = 9; 6079 = 15; 8534 = 9; 8535 = 9; 8585 = 9; 8586 = 9; 8587 = 9; 10038 = 9; 10050 = 9; 10051 = 9; 10057 = 9; 10059 = 9; 10061 = 9; 10073 = 8; 10087 = 9; 11249 = 5; 12492 = 5; 13191 = 8; 13876 = 5; 13982 = 5; 14384 = 4; 14385 = 9; 14387 = 9; 14388 = 9; 14639 = 9; 14640 = 9; 14902 = 9; 15691 = 8; 16873 = cfr. p. 288; 19627 = cfr. p. 288; 20747 = 9; 20748 = 9; 20844 = 15; 20934 = 4; 20998 = 8; 21044 = 9; 21100 = 9; 21101 = 9; 21103 = 9; 21321 = 1; 22215 = 5; 22258 = 6; 23676 = 4; 23986 = 6; 24161 = 5; 25821 = 5; 26569 = 5; 27703 = 5; 28511 = 9; 28757 = 9; 28895 = 8; 28896 = 9; 28897 = 8; 29098 = 1; 29125 = 1; 30124 = 15; 30232 = 4; 30343 = 9; 30599 = 15; 30600 = 15; 30601 = 15; 30885 = 9; 31191 = 8; 33038 = 8; 33587 = 1; 33654 = 1; 33904 = 5; 35114 = 1; 38191 = 9; 38376 = 9; 38425 = 9; 38429 = 9; 38488 = 1; 38497 = 9; 38896 = 9; 39303 = 8; 39954 = 9; 40054 = 9; 40075 = 9; 40076 = 9; 40406 = 1; 47884 = 5.

FOREST OR TREE NUMBERS, FOLLOWED BY AN *: 14 = 5; 26 = 4; 214 = 5; 309 = 5; 402 = 15; 405 = 15; 484 = 15; 485 = 15; 919 = 5; 1120 = 9; 1121 = 8; 1152 = 1; 1249 = 1; 1409 = 1; 1706 = 8; 1837 = 4; 2167 = 4; 2271 = 9; 2455 = cfr.

p. 288; 2456 = 1; 2456 bis = 1; 2517 = cfr. p. 288; 2917 = 4; 2971 = 6; 3701 = 6; 7926 = 9.

FOREST OR TREE NUMBERS, FOLLOWED BY A LETTER a, t, OR w: 1330a = 8; 3180a = 5; 4035w = 9; 4178w = 9; 4187w = 9; 4191t = 9; 4206t = 9; 4217w = 9; 4219t = 9; 4229w = 9; 4271w = 9; 4297w = 9; 7844w = 9; 7922w = 8.

PLANTAE JUNGHUHNIANAE INEDITAE 58 = 5; 59 = 5.

KORTHALS s.n. = 5.

KUNSTLER 6116 = 12.

KRUKOFF 4243 = 8.

LAMBACH 1232 = 6.

LAMBAH 2720 = 8.

LEDERMANN 8137 = 15; 9795 = 15; 9818 = 15; 9829 = 15; 10851 = 15; 11534 = 15.

LONG 3047 = 12.

LÖRZING 640 = 4; 5131 = 6; 5714 = 7; 6322 = 7; 6387 = 7; 8960 = 6; 10058 = 6.

MAINGAY 705 = 12; 706 = 15; 707 = 12; 708 = 8.

MAJID PEON 11622 = 8.

MAT 6020 = 1.

MOUSSET 264 = 4; 1023 = 4; 1075 = 9.

NAGEL 226 = 9.

NATIVE COLLECTOR 49 = cfr. p. 288.

NOERKAS (Exp. VAN VUUREN) 287 = 1.

OMAR 00054 = 13; 8538 = 8.

RAMOS 1451 = 15.

REINWARDT s.n. = 5.

RIDLEY s.n. = 8; 4578 = 8; 4941 = 14; 5082 = 15; 6020 = 1; 6775 = 1; 10675 = 5; 11095 = 8; 13223 = 15.

RIEDEL s.n. = cfr. p. 288.

ROBINSON & KLOSS 19 = 5.

RUTTEN 1831 = 8; 1832 = 15.

SAPIIN 163 = 5.

SCORTECHINI s.n. = 1; 1963 = 15.

SOW & TACHOU 16425 = 14; 16446 = 8; 16857 = 6.

STRUGNELL 12487 = 15.

SYMINGTON 21051 = 8; 24688 = 6.

TEYSMANN s.n. = 1 (3 ×), 4; 2745 H. B. = 4; 4251 H. B. = 1; 4473 H. B. = 1; 6664 = 15; 6717 = 15; 8957 = 4; 11849 = 1; 11894 = 1; 12117 = 1; 12436 = 1; 13832 = 1.

TEYSMANN & DE VRIESE s.n. = 1.

THEUNISSEN 8 = 6.

VAN DER PAARDT 66 = 1.

VAN HASSELT s.n. = 5.

VAN STEENIS 909 = 1; 1221 = 15; 1263 = 15.

VINCENT 4671 = 4.

WARBURG s.n. = 4; 4671 = 4; 4672 = 4; 17093 = 4; 17094 = 4; 18116 = 11.

WATURANDANG 43 = 16; 158 = 16.

WEISMANN 210 = 16.

WINCKEL 78β = 5; 750β = 5; 1570β = 5.
WOOD 2252 = 15.
WRAY 2927 = 8; 3302 = 15; 3486 = 8; 3632 = 14.
YATES 2485 = 6.
ZIPPELIUS 197c = 1.
ZOLLINGER 785 Z = 9; 803 = 5; 2289 = 1; 2292 = 4; 3391 Z. M. = 1; 3907 = 8.

INDEX TO VERNACULAR NAMES.

INDEX TO SCIENTIFIC NAMES.

New names in **Doric** types, synonyms in *italics*; page numbers in Doric denote most important mention, an asterisk * before a page number denotes a figure.

GRAMMATICAL OBJECTIONS TO THE INTERNATIONAL RULES OF BOTANICAL NOMENCLATURE, ADOPTED AT CAMBRIDGE IN 1930,

by

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It is generally known that botanical nomenclature, though sprung from mediaeval scientific Latin, and agreeing, in its orthography for the greater part, in its grammar as much as possible, with classical Latin, shows countless forms which not only from a classical-grammatical, but also from a mediaeval-grammatical point of view, must be looked upon as errors. These errors are for the greater part due to an inadequate knowledge of Latin and Greek grammar, or to indifference or lack of good taste on the part of botanists. And since a botanist cannot be expected to abstain from giving new names to plants until in the opinion of philologists he is sufficiently acquainted with Latin, Greek and other languages which he may have to use, it is unavoidable that the number of philological mistakes in botanical nomenclature should be steadily increasing. It may be disputed whether the mistakes should be corrected, or whether, granting the desirability, such a thing is impossible. The present author was at one time convinced that correction ought to take place systematically, but after some attempts to contribute to it he realised that it was impossible to carry it through in a consistent manner without detriment to botany, and that a non-consistent or a consistent-partial correction would also cause difficulties without giving satisfaction. In any case great indulgence is desirable towards the countless mistakes that have been made in good faith.

This, however, does not alter the fact that it is in all respects desirable to avoid such mistakes in future to the best of our knowledge.

The attitude, however, towards this question, as it is expressed in the International Rules of Botanical Nomenclature, is a remarkable one. In general they recommend a correct application of Latin and Greek grammar, be it now in classical [cfr. Art. 4, al. 3; Art. 7; Recomm. XI.

sub (*a*); Art. 27, last sentence; Recomm. 38; Recomm. XLII; Recomm. XLIV], then again in a mediaeval sense [Art. 25; Recomm. X sub (*c*); Recomm. XXXIX sub (*c*); Recomm. XL; Art. 71, sub (4)]. Nevertheless here and there rules and recommendations are found at variance with grammatical rules, irrespective whether the point of view is a classical or a mediaeval one. And contrary to the expectation that such rules will be noticed later on, and cancelled at following congresses, they are seen to increase slowly, and also at the last congress in 1930 new recommendations, and even a new rule, have been added, which not only recommend offences against Latin and Greek grammar, but make these even obligatory. As the knowledge of Latin and Greek grammar of botanists has been steadily deteriorating for the last half century, and is sure to deteriorate still further in the coming decades, the fear is justified that the present and future generations of botanists may take these rules and recommendations as a guide in forming new names, and that the number of mistakes in nomenclature may increase in a unnecessarily high degree. It is for this reason that it seems to me advisable to point out these grammatically incorrect rules and recommendations. The difficulties will be dealt with in the following in the same order in which they appear in the rules themselves. (International Rules of Botanical Nomenclature adopted by the Fifth International Botanical Congress, Cambridge, 1930; suppl. to the „Journal of Botany", June 1934; by Taylor and Francis, London).

Recommendation IX, first sentence: Orders are designated preferably by the name of one of their principal families, with the ending *-ales*.

In connection with this it should be observed that it is desirable to alter the ending *-alis* in *-aris*, when the root to which it is added contains a *l*, especially when this *l* occurs in the last syllable, but with exception of the cases, in which between the *l* of the root and that of the ending occurs a *r*. So one should write ***Primulares, Selaginellares***, not ***Primulales, Selaginellales***.

Art. 24. Names of subfamilies (*subfamiliae*) are taken from the name of one of the genera in the group, with the ending *-oideae*, &c.

Here we may observe that, strictly speaking, the ending ***-oideae*** does not exist in Greek or Latin. There are compounds in *-ειδης*, in Latin ending in ***-ides***, which retain *-ides* in the feminine plural. It is an incorrect usage to change the ending ***-ides*** into ***-idea*** and ***-ideum*** in the feminine and neuter, or even to form the ending ***-ideus*** if transferring such names to the masculine gender. Therefore the formation of words in ***-ideae*** is incorrect.

Recommendation X, (e), (f), and (g): Botanists who are forming generic names show judgment and taste by attending to the following recommendations:

(*e*) To avoid adjectives used as nouns.

(*f*) Not to give a genus a name whose form is rather that of a subgenus or section (e.g. *Eusideroxylon*, a name given to a genus of *Lauraceae*. This, however, being legitimate, cannot be altered).

(*g*) Not to make names by combining words from different languages (*nomina hybrida*).

Sub (*e*) probably only Latin genus-names are meant, as *Mirabilis, Gloriosa* and *Impatiens,* and not the far more numerous Greek ones. Although no one takes offence at those names, and even the Romans used names as Crispus and Rufus, and in later Latin names as Clemens and Felix are numerous, the introduction of genus-names as *Pennatus* and *Glandulosus* is certainly not to be recommended. In Greek, however, the case is entirely different. Cfr. the discussion of art. 72.

With regard to (*f*) it may be pointed out, that the names referred to, namely those with *Eu-*, denoting a subgenus or section, are grammatically wrong, and that it would be unfair to avoid correctly formed names, as *Eusideroxylon, Eucalyptus, Euonymus,* &c on account of this paragraph. See further discussion of Recomm. XI.

As to (*g*) it may be said that the formation of *nomina hybrida* (rectius *hibrida*) occurred already in classical Latin, and that it was far from rare in mediaeval Latin. The puritanical point of view, expressed in the above recommendation, is inconsistent with the further grammatical tendency of the rules for nomenclature.

Recommendation XI, (a) and (b): Botanists constructing names for subgenera or sections will do well to attend to the preceding recommendations and also to the following:

(*a*) To give, where possible, to the principal division of a genus a name which recalls that of the genus with some modification or addition. Thus *Eu-* may be placed at the beginning of the generic name when it is of Greek origin, *-astrum, -ella* at the end of the name when Latin, or any other modification consistent with the grammar and usages of the Latin language: e.g. *Eucardamine* (from *Cardamine*), *Drabella* (from *Draba*).

(*b*) To avoid giving to a subgenus or section the name of the genus to which it belongs, with the ending *-oides* or *-opsis*: but on the contrary to reserve this ending for a section which resembles another genus and by then adding *-oides* or *-opsis* to the name of that other genus, if it is of Greek origin, to form the name of the section.

As to (*a*) it should be noticed that the formation of subgenera and sections by means of prefixing *Eu-* to genus-names is a misuse in a grammatical sense, and that either lack of grammatical knowledge or lack of good taste underlies the formation of such names. In the first place because Greek εὐ does not mean „genuine" (this ought to be γνήσιος), and secondly because the formation of compounds by fusing

a qualifying adjective with a qualified noun is not permissable in Greek (in Sanskrit, however, and in German, this is possible). The names referred to, formed by means of prefixing *Eu-* (cfr. e.g. Engl. & Prantl, Nat. Pflanzenfam., Register zu II—IV, p. 156—171) have either no meaning whatever or a meaning entirely different to what is intended. An *Eualoë* is nothing, and a plant cannot be *eualoë*; an *Euarabis* is nothing, and a plant cannot be *euarabis*. *Euloranthus* does not mean a genuine *Loranthus*; *Gnesioloranthus* would be an incorrect formation. *Euloranthus,* however, means a flower with fine or large straps, or a plant having flowers with fine or large straps. *Euartocarpus* means a fruit yielding good bread, or a plant yielding good bread-fruit. *Gnesio-aloë* or *Gnesiarabis* would be an un-Greek formation, though γνησιοσ would at least mean „genuine".

As to (*b*) it may be observed that here reference is made to the ending *-oides*. Grammatically it would have been better to speak of the ending *-ides*. This ending is often not understood even by botanists with a classical training. Otto Kuntze, for instance, changed all names in *-oides* into such in *-odes*. It would be preferable to speak of compounds with Greek εἶδοσ.

Recommendation XXXIV again mentions names compound with *Eu-*, about which the reader is requested to compare the discussion of Recommendation XI.

Recommendation XXXV goes still farther and recommends for subspecies and varieties names composed with *eu-*, as *eu-alpina,* which, if possible, is even more inconsistent with grammar and good taste than the cases dealt with in Recommendation XI.

Recommendation XXXVI mentions the ending *-oideae*, which is incorrect, and the ending *-ales,* without drawing the attention to the form *-ares*. Cfr. the discussion of Recommendation IX and Art. 24.

Recommendation XL, (a), (b), and (d). When a new specific or other epithet is taken from the name of a man, it should be formed in the following manner:

(*a*) When a name of the person ends in a vowel, the letter *i* is added (thus *Glaziovi* from Glaziou, *Bureaui* from Bureau) except when the name ends in *a*, when *e* is added (thus *Balansae* from Balansa).

(*b*) When the name ends in a consonant, the letters *ii* are added (thus *Magnusii* from Magnus, *Ramondii* from Ramond), except when the name ends in *-er,* when *i* is added (thus *Kerneri* from Kerner).

(*d*) When epithets taken from the name of a person have an adjectival form they are formed in a similar way (e.g. *Geranium Robertianum, Verbena Hasslerana*).

As to (*a*) and (*b*) I will merely remark that in these paragraphs so little heed is paid to grammar that they are obviously only intended

as an aid to memory for those who do not know a word of Latin or Greek. Moreover, they unnecessarily tie botanists down to stringent rules, which in the middle-ages were not used. There is no single reason for adhering to this recommendation rigidly, so long as one is more or less acquainted with mediaeval Latin; for those, however, who are not, there is just as little reason to depart from it.

In (*d*), however, a mistake has crept in. Here the impression is made that the ending *-ianus*, with which *Robertianus* is formed, ought to be changed into *-anus*, when the name ends in *er*. It is true that the Romans themselves sometimes used *-anus* instead of *-ianus*, but in order to avoid confusion with the ending *-anus*, e.g. of *africanus*, which has a different meaning, this is in no case to be recommended to botanists, neither for names in *-er*, nor for other names. *Hassleriana* therefore is better than *Hasslerana*.

Art. 72, (2). The gender of generic names is governed by the following regulations:

(1) ....

(2) Generic names which are modern compounds formed from two or more Greek or Latin words take the gender of the last. If the ending is altered, however, the gender will follow it.

Examples of names formed from Greek words: The generic name *Andropogon* L. was treated by Linnaeus as neuter, but it, like all other modern compounds in which the Greek masculine word *pogon* is the final element (e.g. *Centropogon, Cymbopogon, Bystropogon*), is now treated as masculine. Similarly all modern compounds ending in *-codon, -myces, -odon, -panax, -stemon* and other masculine words are masculine. The generic names *Dendromecon* Benth., *Eomecon* Hance and *Hesperomecon* E. L. Greene are treated as feminine, because they end in the Greek feminine word *mecon*, poppy: the fact that Bentham and E. L. Greene respectively ascribed the neuter gender to the names *Dendromecon* and *Hesperomecon* is immaterial. Similarly all modern compounds ending in *-achne, -carpha, -cephala, -chlamys, -daphne* and other feminine words are treated as feminine.

The generic names *Aceras* R. Br., *Aegiceras* Gaertn. and *Xanthoceras* Bunge are neuter because they end in the Greek neuter word *ceras*; the fact that Robert Brown and Bunge respectively made *Aceras* and *Xanthoceras* feminine is immaterial. Similarly all modern compounds ending in *-dendron, -nema, -stigma, -stoma* and other neuter words are neuter. Names ending in *-anthos* (or *anthus*) and those in *-chilos* (or *-chilus*) ought strictly speaking to be neuter, since that is the gender of the Greek words *anthos* and *cheilos*. These names, however, have been with very few exceptions treated as masculine, hence it is agreed to assign that gender to them. Similarly those ending in *-gaster*, which should strictly speaking be feminine, are treated as masculine in accordance with botanical custom.

Examples of compound generic names where the termination of the last word is altered: *Hymenocarpus, Dipterocarpus* and all other modern compounds ending in the Greek masculine *carpos* (or *carpus*) are masculine. Those in *-carpa* or *-carpaea*, however, are feminine, e.g. *Callicarpa* and *Polycarpaea*; and those in *-carpon, -carpum* or *-carpium* are neuter, e.g. *Polycarpon, Ormocarpum* and *Pisocarpium*.

This part of a rule (alas, not only a recommendation) is a mixture of grammatically correct and incorrect remarks and opinions, and for that reason requires a somewhat ampler discussion, the more so because it is a complete innovation compared with the rules of nomenclature of 1910.

To begin with I will make a few remarks on grammatical composition of Greek names in general.

A tree (δενδρον) bearing roses (ῥοδον) may be called a rosetree (ῥοδοδενδρον), in Latin *Rhododendron* or *Rhododendrum*. *Rhododendrum* being a kind of *dendrum*, and *dendrum* being neuter, *Rhododendrum*, too, must be neuter. It is true that such compounds of two nouns of which one qualifies the other, are hardly permissable in classical Greek, but in later Greek they became more and more common and of Greek botanical vocabulary they form an important part.

A shrub (θαμνοσ) that has the shape of a besom, or of which besoms (σαροσ) are made, may be called a besom-shrub (σαροθαμνοσ), in Latin *Sarothamnos* or *Sarothamnus*; and a *Sarothamnus* being a kind of *thamnus*, and *thamnus* being masculine, *Sarothamnus*, too, must be masculine.

A leaf (φυλλον) consisting of a pair or yoke (ζυγον) of leaflets we may call a yoke-leaf (ζυγοφυλλον). For the reason mentioned above the name of that leaf must be neuter. But we can transfer the same name to the whole of the plant. In such cases we mention the leaf instead of the plant, and the whole plant is, as it were, a kind of *phyllum*, and the name must therefore be neuter. Such transferred plant-names, which, as a matter of fact, are but names for part of the plant (leaf, flower, fruit, seed) are known in many other languages.

We can, however, give a name to a plant by means of converting an adjective into a noun. Thus in many languages we can indicate plants by names corresponding with e.g. „long-leaved", „short-fruited", „small-seeded", &c., in Greek Μακροφυλλοσ or Μακροφυλλον, Βραχυκαρποσ or Βραχυκαρπον, Μικροσπερμοσ or Μικροσπερμον, according to what is meant by the name, a tree, δενδρον, a shrub, θαμνοσ, or some other thing. And transcribed into Latin these names are *Macrophyllus, -a, -um, Brachycarpus, -a, -um, Microspermus, -a, -um,* according to whether we indicate a *frutex,* or an *arbor,* or something else by it. It is therefore incorrect, if Recommendation X (*e*) advises to avoid forming genus-names by means of converting adjectives into nouns.

Classical Greek already was very rich in such names, and later Greek even more so. Φιλιπποσ, e.g., was not a kind of ἱπποσ, but some

one fond of horses (ἱπποσ). Τιμαρετη was not a kind of ἀρετη, but a woman honouring truth (ἀρετη). Νικολαοσ was not a kind of λαοσ, but some one conquering the people (λαοσ). Εὐβουλοσ was not a kind of βουλοσ, but some one giving good advice (βουλη). Ξανθιπποσ was not a yellow horse, but some one possessing a yellow horse and Ξανθιππη was a woman called after Ξανθιπποσ, or a woman possessing a yellow horse. Ἀνδρομαχοσ was not a kind of μαχοσ, but some one who fought with men, or about whom many men fought, just as Ἀνδρομαχη was a woman either simply called after a certain Ἀνδρομαχοσ, or a woman disputed by men.

The same may be applied to various plant-names.

Ammochloa is a kind of *chloa* (χλοη), *Calamagrostis* a kind of *agrostis* (ἀγρωστισ), *Cephalotaxus* a kind of *taxus*, *Chamaecyparis* a kind of *cyparis*, *Chionodoxa* a kind of *doxa* (δοξα), *Cystopteris* a kind of *pteris* (πτερισ), *Helosciadium* a kind of *sciadium* (σκιαδειον), *Hyoscyamus* a kind of *cyamus* (κυαμοσ), *Liriodendron* a kind of *dendron* (δενδρον), *Melilotus* a kind of *lotus* (λωτοσ), *Oenanthe* a kind of *anthe* (ἀνθη), *Petroselinum* a kind of *selinum* (σελινον), *Pseudotsuga* a kind of *tsuga*. *Sciadopitys* a kind of *pitys* (πιτυσ). All these names should therefore have the gender of the last element of the compound.

By transference *Aegopodium*, too, can be a kind of *podium* (ποδιον), and similarly *Agrostemma* a kind of *stemma* (στεμμα), *Alopecurus* a kind of *urus* (οὐροσ), *Caprifolium* a kind of *folium*, *Ceratophyllum* a kind of *phyllum* (φυλλον), *Equisetum* a kind of *setum*, *Lycopus* a kind of πουσ, *Tragopogon* a kind of *pogon* (πωγων). Therefore these compound names, too, should have the gender of the last element.

Amorpha, however, is not a kind of *morpha*, but a plant without (ἀ-) shape (μορφη); *Ampelopsis* is not a kind of *opsis*, but a plant of a certain appearance (ὀψισ), *Biscutella* is not a kind of *scutella* but a plant with two *scutella*, *Brachypodium* is not a kind of *podium* but a plant with short stalks (ποδιον), *Cephalanthera* is not a kind of *anthera* but a plant with *antherae* of a certain kind, *Ceratocephalus* is not a kind of *cephalus*, but a plant with a certain kind of heads (κεφαλη), *Chorispora* is not a kind of *spora*, but a plant with *sporae* of a definite kind, *Coeloglossum* is not a kind of *glossum*, but a plant with a certain kind of tongue (γλωσσα), *Diëlytra* is not a kind of *elytra*, but a plant with a certain number of elytra (ἐλυτρον), *Dimorphotheca* is not a kind of *theca*, but a plant with two kinds of thecae (θηκη), *Diplotaxis* is not a kind of *taxis*, but a plant with double rows (ταξισ), *Echinops* is not a kind of *ops*, but a plant having the appearance (ὠψ) of a

hedge-hog (ἐχινοσ), *Euonymus* is not a kind of *onymus* but a plant bearing a beautiful name (ὄνυμα).

There is no reason whatever for giving these names the gender of the last element; they must take the gender of the noun that is connected with them in our thoughts.

Sometimes the gender is to be recognised by the ending of the name, sometimes not. An example of a name where the gender is not recognisable is *Aceras*. Something having no horn we may call hornless, ἀκερασ, *aceras*, and irrespective whether by this name we mean a masculine, feminine or neuter noun, the name is *Aceras*. On the other hand it is not possible to know the gender by the ending. It may be a *herba aceras*, a *flos aceras*, a *semen aceras*, &c. To look upon *Aceras* as a neuter because the last element, κερασ, is neuter, is contrary to grammar.

A more difficult example is e.g *Tricholoma*. Something having the appearance of a hair-fringe, e.g. an alga or a mould, we may call τριχολωμα, *Tricholoma*. As λωμα is neuter, *Tricholoma* must be neuter as well. However, to something having a hair-fringe we can also give the adjectival name *Tricholoma*, from Greek τριχολωμοσ or τριχολωμον, Latin *tricholomus*, *-a*, *-um*. The well-known toad-stool *Tricholoma* cannot very well be looked upon as a kind of *loma*, and therefore ought to be considered as feminine, not as neuter.

The same reasoning holds good for all names in *-nema*, *-stemma*, *-gramma*, &c. All these names may either be taken as original nouns, and in this case must be considered to be neuter, or they may be taken as converted adjectives, in which case they must unconditionally be looked upon as feminine. To mention an example, the alga *Zygonema* will in all probability have to be taken as neuter, the Angiosperm *Spironema* as feminine, if we are to adhere to grammar.

From the above it becomes sufficiently evident that we cannot tell simply by the ending or by the last element of the compound what gender a name must have according to grammar. For this, knowledge and understanding of the formation of the name is necessary.

Another group of names which especially deserve our attention, are those having a Greek s-stem for their last element, as ἀνθοσ, ἀλγοσ, πενθοσ, σκελοσ, εἶδοσ, &c. They again can be either substantival or adjectival. As original nouns they can either end in *-os*, or this ending can be latinised into *-us*, in which case already in classical Latin the masculine gender could be used as well as the neuter gender. As adjectives, however, they must end in -ησ, ησ, -εσ, in Latin *-ēs*, *-ēs*, *-ĕs*. So names in *-anthes*, *-chiles*, *-penthes*, *-ides*, &c., are certainly adjectives,

names in *-anthos* or *-anthus*, *-chilos* or *-chilus*, &c., certainly nouns, if formed in a grammatical manner. Names in *-anthe*, *-antha*, *-anthon*, *-anthum*, can never be legitimately formed from ἀνθοσ, but at utmost from another word, e.g. ἀνθη.

After this introduction, which is required for a good understanding of the matter, Art. 72 can be dealt with shortly.

The following may be observed: As to its meaning *Andropogon* can be either a transferred noun or a converted adjective. In the first case it must be masculine, like πωγων; in the latter case it is equally possible that it is feminine or neuter. On the same grounds there is no single reason why other names in *-pogon*, and such in *-codon* (κωδων), *-myces* (μυκησ), *-panax* (πανας), *-stemon* (στημων), should all be masculine. It should first be ascertained whether they are meant as transferred nouns or as converted adjectives, and whether the gender may be recognised by the ending. The names in *-odon* are probably mentioned here by error; although there exists an Ionian variant ὀδων of ὀδουσ, these names are probably adjectival, transcribed from Greek names in -οδον, derived from ὀδουσ, and for that reason neuter. The same considerations hold good for names in *-achne*, *-carpha*, *-cephala*, *-chlamys*, *-daphne*, *-gaster*.

The remark that *Aceras* and *Xanthoceras* were wrongly taken as feminine by Robert Brown, is against all grammar, and is a great injustice to this botanist.

For names in *-dendron*, *-nema*, *-stigma*, *-stoma*, *-anthos*, and *-chilos*, compare what has been said above.

Why *Callicarpa*, and *Polycarpaea*, indeed, must be feminine, *Polycarpon*, *Ormocarpon* and *Pisocarpium* neuter, is also evident from the above.

Summarising what seems to me the result of the above considerations as to the Rules of Botanical Nomenclature, I should like to propose to gather all the grammatical and quasi-grammatical rules into one chapter of grammar that meets the requirements both of botanists with, and of those without a classical training, and to take for a basis, that, equally in the orthography as in the definition of the gender of names, we should follow the first choice of the author for names already formed, but that for names yet to be formed we should as much as possible proceed on classical-Latin lines, and wherever this may be necessary on post-classical lines, but never on lines inconsistent with all grammar.

The late publication, alas, of the rules of nomenclature, agreed

upon in 1930, makes it impossible to make more concrete proposals here. The best plan would probably be to leave this question to a committee of botanists who are more or less competent in this matter, and to whom a period of five years should be allowed in order to discuss matters with philologists.

IDENTIFICATION OF SOME MALAYSIAN GRASSES

by

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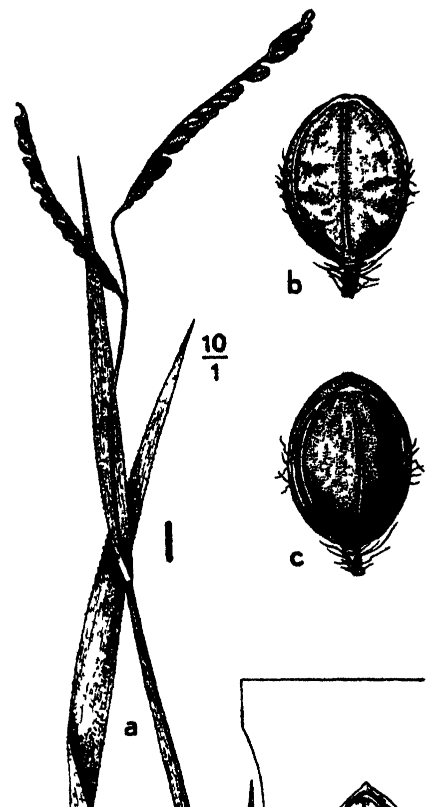
When BUSE gave an enumeration of the grasses collected by JUNGHUHN in Java and Sumatra, he mentioned under *Paspalum* a species, described by RETZIUS in the year 1781 as *Paspalum hirsutum*. BUSE identified a grass from Sumatra as being the species of RETZIUS, on account of the description, having certainly not studied the authentic specimen, which was at that time not easy to consult. It may be that even the work of RETZIUS was not at his disposal, it is probable that he studied only the description, given afterwards in LAMARCK's Encyclopédie. RETZIUS described his species from China, where it was collected by BLADH. Although the description of RETZIUS agrees fairly well with BUSE's plant, we are in modern times not so satisfied with such an identification, because it is *a priori* not sure at all that the chinese species is identic with a grass from the high plateau of Sumatra, the more because since the description by RETZIUS and the identification by BUSE, such a *Paspalum* was never found in the wide area between China and Sumatra. I therefore carefully studied the type of RETZIUS at the herbarium of Lund (Sweden), which was kindly forwarded for study from the director at Lund and I compared it with BUSE's type, preserved at the Rijksherbarium. The latter is in a very good condition. Already at first sight the two types agree very much especially in the vegetative parts, the number of racemes, their length and general form In the genus *Paspalum*, a very large one, much weight is given by agrostologists to the form and outline of the spikelets and I will therefore give my opinion on the type of RETZIUS first. The plant consists of an upper part of the culm with 3 very hirsute leaves and 2 distant racemes. The spikelets have hairy pedicels, the short hairs are sparingly mixed with long ones. The form of the spikelets is obovate-oblong; they are obtuse at the summit and rounded. The first glume (mostly rudimentary in the genus) is wanting the second one, which is very convex, is slightly shorter than the spikelet, minutely punctulate and

provided with 5 very strong nerves, a midnerve and two marginal ones, the latter anastomosing upwards and running into the midnerve at the top, which is thickened where the nerves meet. The sterile lemma or third glume is flat and as long as the spikelet; it has 3 strong nerves, a midnerve and 2 submarginal ones, anastomosing at the summit; the true margins are membranaceous and distinctly hairy at the middle, the hairs more or less flexuous or curved. Besides these 3 nerves there are 2 more nerves at a rather broad distance from the midnerve; these two nerves are faint and distinct only at the base of the glume and evanescent upwards, being undulate and giving that part of the glume a scrobiculate, transversely wrinkled appearance. The fruit (fertile lemma) is dark brown and exposed by the shortness of the covering glume. From all these characters it is evident that RETZIUS's plant belongs to a group of species in the genus *Paspalum* called by Mrs. AGNES CHASE the „*plicatula*". Representative species of this group are the well-known New World *Paspalum plicatulum* MICHX. and the variable Old World species *Paspalum scrobiculatum* L.. The characters of the true *Paspalum hirsutum* are given on my plate, which is an exact copy of the type specimen, the spikelets being magnified 10 times. Returning to BUSE's plant from Sumatra, I indicate here the different characters of the spikelets. Their form and outline is different, they are not only a little longer but more elliptic, not rounded at the summit but distinctly obtusely apiculate; the convex glume is 3-nerved only, the marginal nerves not doubled, the glume is longer than the fertile lemma, obtecting it entirely and protruding above it; the flat sterile lemma is more narrowed upwards too with 3 very distinct nerves and 2 interjecting faint ones, the surface is wrinkled as in the American *Paspalum plicatulum* and the body of the glume is perfectly glabrous. Comparing types and the figures given by me, we see thus that there are distinct differences between the spikelets of the two types and it is therefore evident that we have here two different species. These differences between the two species as to the morphological characters are supported by the very different geographical distribution, the plant described by BUSE being hitherto only known from the prairies of the plateau of Padang lawas in Sumatra. Since BUSE described his species and the characters of the spikelets are given here *in extenso*, it is not necessary to describe BUSE's plant once more. It is named here after the collector Dr HORNER as a species, endemic on Sumatra, the **Paspalum Horneri** HENR. = *Paspalum hirsutum* BUSE, non RETZIUS.

A puzzling plant was described by BUSE in the year 1856 in DE

Vriese's Plantae Indiae Batavae Orientalis as *Streptachne indica.* Buse was an accurate observer and described this plant exactly but he unfortunately overlooked an important character. Having studied his type, a plant collected on Java by Reinwardt, I found that the spikelets have an articulation below the glume and thus easily fall of *in toto.* In the large tribe of the *Agrostideae* to which Buse's plant belongs, this *Streptachne* is thus not a member of the subtribe *Stipeae* as Buse supposed, this subtribe having always an articulation above the glumes which are persistent at maturity. It was thus at once evident that Buse's plant was not a *Steptachme* at all, but more allied with such genera as *Polypogon* and *Chaeturus.* It belongs to the genus *Garnotia* which is already known from Java. Buse's species is placed by me under *Garnotia stricta* Brogn..

Another curious grass was described by Buse in the year 1854 as the endemic *Schizachyrium paradoxum.* He indicated already that his species was allied to the *Schizachyrium brevifolium* (Sw.) Nees. In his monograph of the *Andropogoneae* this species was treated by Hackel, who did not see the plant and remarked only on p. 365: „*ex descriptione videtur A. brevifolii var.*



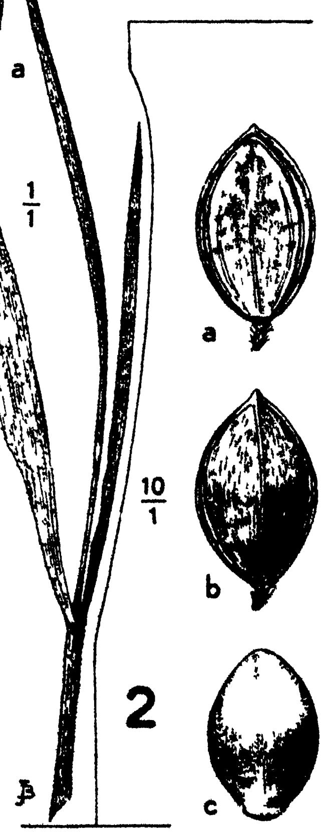


Fig. 1. a. *Paspalum hirsutum* Retz. nat. size, b. spikelet in front, c. id. from the back, both magnified 10 times.

Fig. 2. *Paspalum Horneri* Henr., a. spikelet in front, b. id. from the back, c. sterile lemma, all magnified 10 times.

mutica." BUSE's plant is, however, not simply an unawned *Andropogon brevifolius*. The latter, in its typical form, has a well developed 8—12 mm long awn in the sessile spikelets, which are 3—4 mm long. In BUSE's plants the sessile spikelets are muticous but they are only about 2 mm long; the awn of the pedicelled spikelets in the typical *A. brevifolius* is 4—5 mm long, in BUSE's specimens only about ½ mm long and as long as the spikelet. From a large material of the *Schizachyrium brevifolium* this species is, in accordance with HACKEL's beautiful monograph, characterized by the sessile spikelets, varying in length from 3—4 mm; they have awns from 8—12 mm long, the pedicelled spikelets being reduced to a glume, 1—1½ mm long, which is provided with a more or less distinct awn. Certainly the length of the awns is not a very important taxonomic character, but the length of the spikelets is accepted by agrostologists for discriminating allied species. If we are not willing to accept BUSE's plants as representing a separate species, it has such striking spikelets that this characteristic plant is better acceptable as a subspecies, on account of the very small, only 2 mm long sessile spikelets without an awn; at the same time the pedicelled reduced spikelets are very small (only ½ mm long), but with a distinct subula or awnlet of about the same length. It is noteworthy that this subspecies is hitherto only known from the type locality near Padang, Sumatra's West Coast. BUSE's species has therefore to be named **Schizachyrium brevifolium** (Sw.) NEES subspec. **paradoxum** (BUSE) HENR. nov. subsp.. To this subspecies belong, however, also some interesting plants where the sessile and pedicelled spikelets are both entirely unawned, the only difference between these plants and the authentic *S. paradoxum* being that the reduced pedicelled spikelet, having the same length, is quite muticous. I indicate this form here as a variety of the subspecies *paradoxum*, a variety having a much larger distribution, being known from Tonkin, the Philippine Islands and North Borneo. It is described here as **Schizachyrium brevifolium** NEES subsp. **paradoxum** HENR. var. **inerme** HENR. nov. var.: *Spiculae pedicellatae tabescentes vix ½ mm longae, ad glumam primam muticam redactae.*

Tonkin: collines herbeuses à la base du Mont Bavi, 1 août 1886. B. BALANSA no. 1745 (typus in Herb. Lugd. Bat. sub no. 908.80-111.) Philippine Islands: Mindanao; Todaya (mount Apo), District of Davao, Oct. 1909. A. D. E. ELMER no. 11939; Mindanao; Bukidnon, Tangculan and vicinity June-July 1920. M. RAMOS et G. EDANO. Herb. Bur. of Science no. 39204.

British North Borneo: Mount Kinabalu, Dallas, 3000 feet, 10 Dec. 1931 J. et M. S. CLEMENS no. 27540. All the specimens mentioned here are preserved in the Rijksherbarium.

STAPF described in the year 1894 *Deschampsia flexuosa* TRIN. var. *ligulata* from British North Borneo. This interesting plant was recently distributed in very beautiful specimens by J. and M. S. CLEMENS from Mount Kinabalu. The typical *Deschampsia flexuosa* is a species of the northern temperate zone. It has a short ligule and a very different aspect. This species is somewhat variable in habit and especially in the higher regions we find a plant described as *Aira montana* by LINNÉ. The latter was observed in Scandinavia and in the Alps of Central Europe and a curious from with very short leaves also in the mountains of Spain. In all these plants the short ligule is about 2 mm long, but the characters of the more condensed panicle somewhat more agree with those of STAPF's variety, which is, as mentioned above, very striking with its remarkable long ligule. The morphological character of the long ligule is used in such grass genera as *Poa, Calamagrostis, Stipa* and others to distinguish different species, which are otherwise not so easy to recognize, so that it is, in my opinion, better to accept STAPF's variety as a distinct endemic Bornean species under the name of **Deschampsia ligulata** (STAPF) HENR. nov. spec..

As to the generic name *Deschampsia,* given by BEAUVOIS for some species described by LINNÉ under *Aira,* I must remark that *Aira,* being a valid name, was published by him with 14 species, the genus being divided by him into „muticae" and „aristatae". After being purified by elimination of species, now accepted as belonging to distinct genera such as *Trisetum* (Aira no. 7), *Koeleria* (Aira no. 2), *Molinia* (Aira no. 3), *Catabrosa* (Aira no. 6), *Periballia* (Aira no. 5) and *Corynephorus* Aira no. 12), the remaining european species form the genus *Aira* sensu stricto. There is no agreement among taxonomists as to the type of the genus *Aira.* Selecting a type arbitrarily, does not solve the problem if *Aira caespitosa* and *Aira caryophyllea* are not considered to be congeneric. The best method is to ask what is LINNÉ's concept of his genus *Aira.* He first used this name in his Flora Lapponica, where 4 species have been described, 3 of them are congeneric, the other one is a species of *Trisetum.* These 3 species, *A. caespitosa, A. flexuosa* and *A. montana* form the basis of LINNÉ's genus *Aira* and it is in this case quite indifferent which of these 3 species is selected as the type of *Aira. Deschampsia* of BEAUVOIS is then only a synonym of *Aira.* I am much in favour of this view and agree with Prof. HITCHCOCK's opinion. In

the arrangement of the grasses at the Rijksherbarium, the genus *Deschampsia* is not accepted, the new species is therefore placed there under *Aira* as **Aira ligulata** (STAPF) HENR..

Only one species of the genus *Cenchrus* is found in our Malaysian region. This species is generally known under the name of *Cenchrus inflexus* R. BR. described in the year 1810. This name is, however, not tenable on account of the earlier homonym of POIRET from the year 1804, a quite different species of South America and belonging to a different genus. BROWN's species was therefore renamed by ROEMER and SCHULTES in the year 1817 in Systema Vegetabilium p. 258 as *Cenchrus Brownii*. To this species belongs further the *Cenchrus viridis* SPRENGEL from the year 1825, a name given by American authors to this species, the earlier name being probably overlooked by them. The species, which is widely distributed in the New World from Florida and Mexico to Brazil, is said to be introduced in the Malaysian regions. It may be found in herbaria sometimes as *C. echinatus* L., which is a separate New World species, observed also in Mauritius and the Samoa Islands.

Distribution of Cenchrus Brownii R. et SCH. (as far as represented in the Rijksherbarium).

Annam: Plage maritime à Cameran in 1886 (BALANSA).

Philippine Islands: Manila in 1910 (MC GREGOR in Herb. KNEUCKER exs. no. 833; Luzon in 1915 (MERRILL, Species Blancoanae no. 811).

Selebes: Kp. Koesaeng in 1912 (Exped. VAN VUUREN no. 381).

Ternate: in 1921 (BEGUIN no. 39).

Halmahera: Galèla in 1921 (BEGUIN no. 125, no. 1849).

Seran: G. Pemali in 1917 (Exp. RUTTEN no. 433); island Boano in 1918 (Exp. RUTTEN no. 1300).

New Guinea: River Uta (collector unknown).

Aroe Islands: Dobo in 1922 (danske exped. til Key-Oeerne, JENSEN no. 236).

Timor: ex herb. Paris; without locality leg. ZIPPELIUS).

Java: cultivated in Hort. Bogor. in 1869, TEYSMANN; near Batavia (REINWARDT); id. KUHL and VAN HASSELT).

Australia: collector unknown.

Panama: Culebra Canal zone, HITCHCOCK (Am. Gr. Nat. Herb. no. 622 as *C. viridis*).

Surinam: WEIGELT in 1827 as *C. pungens* H. B. K.; Herb. VAN HALL; HOSTMAN.

This species is represented in the old herb. VAN ROYEN as Cenchrus 2 pr. echinatus.

It is notewhorty that the genus *Cenchrus* is recently sharper distinguished from the genus *Pennisetum,* and a group of *Penniseta* to which belongs *Pennisetum ciliare* LINK, are now recognized as being indeed members of the genus *Cenchrus* on account of the connate rigid bristles or spines at the base of the involucrum. The *Pennisetum ciliare* being a *Cenchrus,* it is evident that the species *Pennisetum Karwinskyi* SCHRAD. is to be placed in the genus *Cenchrus.* For this species we have the name *Cenchrus multiflorus* PRESL, published eight years earlier than SCHRADER's name.

DER BLÜTENSTAND UND DIE BLÜTE VON KORTHALSELLA DACRYDII

von

Dr. J. C. MEKEL †

Arbeit aus dem Botanischen Institut der Reichsuniversität Groningen.

Als JOHANNES CHRISTOFFER MEKEL am 24. Oktober 1934 in Utrecht verschied, hinterliess er Notizen, Präparate und Zeichnungen einer Untersuchung, mit welcher er sich seit seiner Promotion (5. Juli 1933) auf meine Anregung befasst hatte und welche er in der Hauptsache beendigt hatte. Er hatte mir die Ergebnisse schon früher an der Hand seiner Präparate gezeigt und darüber auf der Versammlung des Niederländischen Botanischen Vereins am 7. Juli 1934 kurz berichtet. Die Veranlassung zu dieser Untersuchung und das Hauptresultat teilte ich schon an anderer Stelle (Rec. trav. bot. néerl., 31, p. 758) mit. Obgleich MEKEL keinerlei Manuskript hinterlassen hat, und somit die Form dieser Publikation ganz von mir stammt, erachte ich es gleichwohl als meine Pflicht, die von MEKEL erzielten Resultate unter seinem Namen zu publizieren.

B. H. DANSER.

§ 1. **Das Ziel der Untersuchung** war den Bau des Blütenstandes und der Blüten von *Arceuthobium Dacrydii* RIDLEY zu ermitteln und festzustellen, ob diese Pflanze wirklich ein *Arceuthobium* ist oder, wie eine oberflächliche Untersuchung des Blütenstandes es vermuten liess, eine *Korthalsella*; und falls letzteres sich wirklich als richtig herausstellen sollte, weiter festzustellen, wie der Bau des Andrözeums dieser Art ist, welches für Arten dieser Gattung von VAN TIEGHEM, HAYATA und LECOMTE in verschiedener Weise beschrieben wird.

§ 2. **Material und Methode.** Das Material zu dieser Untersuchung stammte von Pflanzen, welche 1931 von Zweigen von *Podocarpus imbricata* BLUME im Walde des Naturreservates Tjibodas auf dem Gunung Gedé in Westjava gesammelt wurden, und zwar teilweise von F. W. WENT oder C. G. G. J. VAN STEENIS s.n. (vgl. Bull. Jard. Bot. Buitenz., ser. 3, 11, p. 456) und teilweise von W. M. DOCTERS VAN LEEUWEN (No. 14166). Die letzteren wurden freundlichst vom Sammler aus seinen Privatsammlungen zur Verfügung gestellt. Die spezifische Identität mit dem ursprünglichen *Arceuthobium Dacrydii* wurde durch erneute Vergleichung mit dessen Typus, der sich im Besitze des Bota-

nischen Gartens zu Singapore befindet und nochmals gütigst von der Direktion dieses Institutes für unsern Zweck zugesandt wurde, festgestellt.

Von beiden Einsammlungen wurden Stengelspitzen in der gewöhnlichen Weise aus dem Laboratoriumsalkohol über absoluten Alkohol und Xylol in Paraffin übergeführt, dann mit dem Mikrotom auf eine Dicke von 10 μ geschnitten und auf Objektgläser nach Färbung mit Eisenhämatoxylin unter Deckgläsern in Kanadabalsam eingeschmolzen. Es wurden 47 Präparate gewonnen und mit den Nummern 401 bis 447 versehen. Die Präparate 416 bis 447 stammen vom Material Docters van Leeuwen's (Nr. 14166) und sind, weil sie besser waren als die anderen, allein für diese Publikation benutzt worden. Alle werden jetzt in den Sammlungen des Botanischen Laboratoriums der Reichsuniversität Groningen aufbewahrt.

§ 3. **Der Bau des Blütenstandes,** wie er sich aus den Präparaten herausgestellt hat, stimmt weitgehend mit dem von *Korthalsella,* welche Van Tieghem (Bull. Soc. Bot. Fr., 43, p. 84) beschreibt, überein. Nachdem sich zuerst eine einzige axilläre Blüte gebildet hat, entwickeln sich bald, erst kollateral, dann auch serial, aber immer nur in der Richtung der Braktee, Adventivknospen, welche anfangs in deutlichen Reihen, später aber unregelmässig gestellt sind. Diesen Adventivknospen fehlen selbstverständlich Brakteen, und auch Vorblätter sind nicht anwesend; es finden sich jedoch zwischen den Blüten eigentümliche Haare, welche sogar dann und wann die Zwischenräume zwischen den Blüten gänzlich ausfüllen.

Es zeigt sich jedoch ein einziger wesentlicher Unterschied mit der Beschreibung Van Tieghem's. Während Van Tieghem erwähnt, dass die Blüten der von ihm beobachteten Blütenstände grösstenteils, und dann und wann sogar ausschliesslich, männlich waren, ist bei unserer Pflanze einzig die erste axilläre Blüte männlich, während alle später gebildeten Knospen nur weibliche Blüten liefern. Der Stand des männlichen Perigons ist immer nach $\frac{2}{3}$.

§ 4. **Der Bau der männlichen Blüte von Korthalsella nach früheren Untersuchungen.** Die männliche Blüte von *Korthalsella* ist zum ersten Mal von Van Tieghem beschrieben worden (Bull. Soc. Bot. Fr., 43, p. 84). Dieser Forscher hat speziell *Korthalsella Remyana* von den Sandwich-Inseln untersucht und beschreibt sie folgendermassen.

„La fleur mâle a trois sépales, orientés diversement suivant les fleurs, le plus souvent suivant $\frac{2}{3}$, parfois aussi suivant $\frac{1}{2}$, avec des positions intermédiaires. Chaque sépale porte à sa base une anthère

sessile sans faisceau libéroligneux propre, munie de deux sacs polliniques qui s'ouvrent par deux fentes longitudinales pour mettre en liberté un pollen formé de grains ovales à trois plis."

Von den nahe verwandten Gattungen *Bifaria* und *Heterixia* beschreibt VAN TIEGHEM die Blüten nicht und er erwähnt auch nicht, welche Arten dieser Gattungen er untersucht hat. Er sagt nur, dass die Infloreszenzen und Blüten gar nicht von denen der Gattung *Korthalsella* verschieden sind (l.c. p. 165 und 178). Dies ist der Grund, weshalb ENGLER (Nat. Pflanzenfam., Nachtr., p. 138) die Gattungen *Korthalsella, Bifaria* und *Heterixia* unter dem ersteren Namen vereinigt hat.

Bei dem japanischen *Viscum Opuntia* oder *V. japonicum* THUNB., welches VAN TIEGHEM in seine Gattung *Bifaria* und ENGLER darum in die Gattung *Korthalsella* stellt, beobachtete HAYATA eine andere Struktur und Stellung der Staubblätter und gründete deshalb auf diese Pflanze die neue Gattung *Pseudixus*. Er sagt (Bot. Mag. Tokyo, 29, p. 33): „stamens are arranged alternately to the lobes of the perianth, and anthers are two-celled, perfectly uniting with one another at the center of the flower, but quite free from the perianth-lobes, and bursting when mature in the connate suture or opening with a single central pore." An anderer Stelle (Ic. pl. Formosan., 5, p. 189) gibt er auch Abbildungen von männlichen Blüten, welche auf der Oberseite des Synandriums drei radial verlaufende Spalten zeigen, die sich von der Mitte aus ziemlich weit in der Richtung der Mittelnerven der Tepalen erstrecken. Falls diese Spalten wirklich die Grenzen zwischen den Antheren vorstellen sollten, wie HAYATA es sich anscheinend vorstellt, so würden die Antheren wirklich mit den Perigonlappen alternieren, und es würde dann sogar Grund vorhanden sein, um *Pseudixus* zu einer andern Familie zu stellen.

LECOMTE fand nun, dass weder HAYATA noch VAN TIEGHEM die männliche Blüte von *Korthalsella* richtig beschrieben haben. Er sagt (Bull. Mus. Hist. Nat., 22, p. 262):

„En réalité, la fleur mâle, entourée par trois lobes triangulaires, renferme non pas des étamines libres, mais un synandre hémisphérique composé de six sacs polliniques et occupant le milieu de la fleur, sans aucune connexion avec les lobes. Ce synandre est pourvu, à son sommet, d'un pore par lequel s'échappera le pollen (ce qui est facile de constater sur des fleurs quelque peu avancées). Les sacs sont contigus et soudés à leur base vers le centre; mais plus haut se trouve un intervalle dont le pore occupe le sommet."

„En aucun cas et chez aucun échantillon, même chez des fleurs à

lobes largement écartés, je n'ai observé d'étamines séparées, mais toujours et sans exception le synandre dont j'ai déjà parlé."

„Ce synandre étant formé de 6 sacs polliniques (2 par lobe), on comprend qu'il soit loisible à l'observateur, et avec la même raison, d'admettre que ces sacs correspondent deux par deux aux lobes et qu'ils leur sont superposés (van Tieghem), ou bien que les paires correspondent aux intervalles et sont par conséquent alternes avec les lobes (Hayata)."

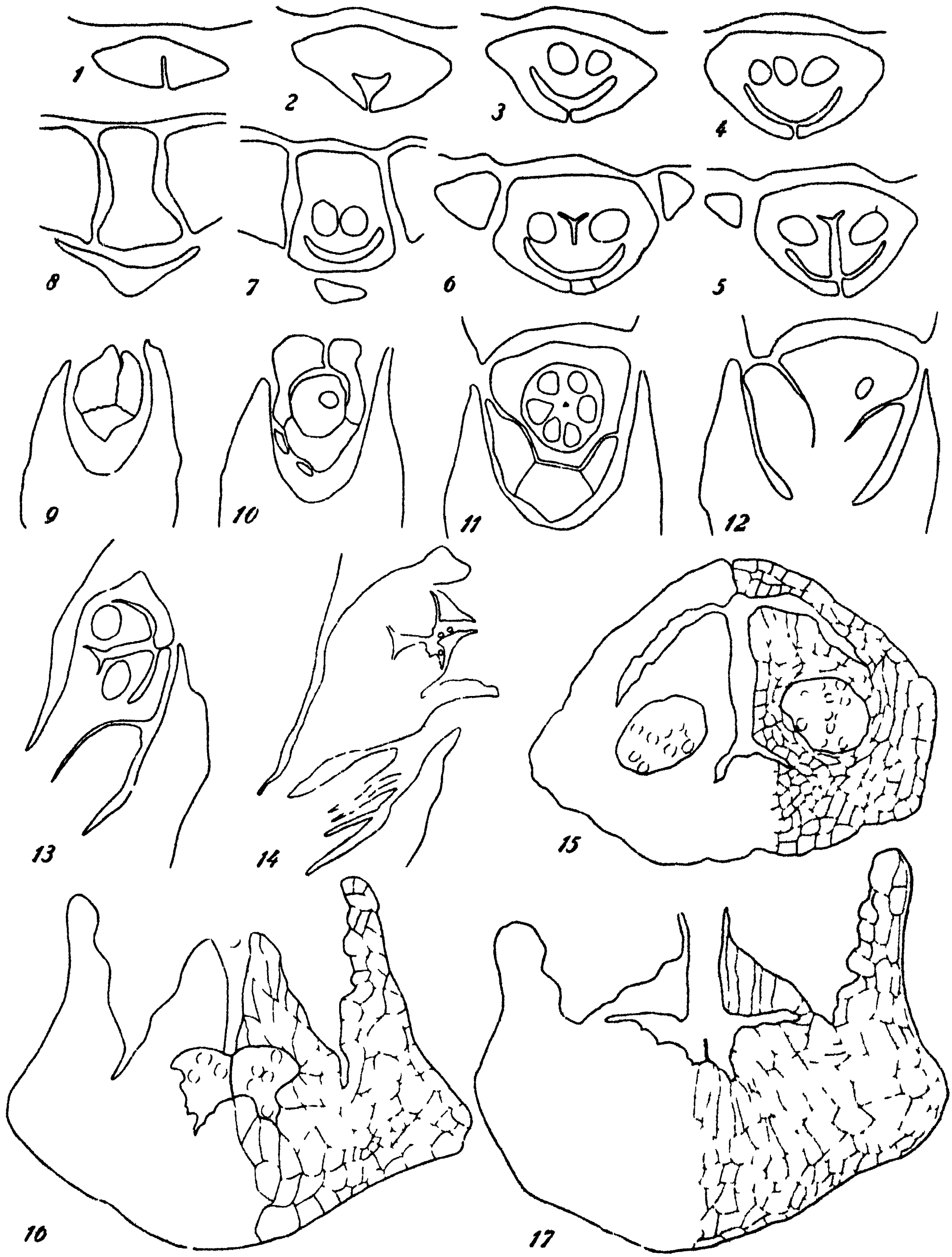
„Sur des sections transversales du synandre j'ai pu observer les cloisons radiales séparant les sacs polliniques, et rien dans la structure uniforme de ces cloisons ne m'a permis d'admettre la possibilité d'une séparation en trois anthères distinctes."

„Le synandre hémisphérique porte, sur toute sa face externe, une assise mécanique sous-épidermique constituée par des cellules dont les épaissements en U présentent leur concavité vers le dehors. Il résulte de cette disposition que la dessiccation provoquée par l'anthère détermine un redressement de la face externe du synandre et, par conséquent, une déchirure de la paroi autour du canal central où manque précisément l'assise mécanique. La sortie du pollen par le pore supérieur se comprend facilement."

§ 5. **Bau der männlichen Blüte nach eigenen Untersuchungen.** Die Frage nach der Struktur der männlichen Blüte unserer Pflanze und nach der systematischen Stellung der Art konnte leicht durch die Anfertigung von vollständigen Reihen von Mikrotomschnitten gelöst werden, von denen einige der instruktivsten auf unserer Tafel dargestellt worden sind. Ein glücklicher Umstand war dabei, dass bei unserer Art in jeder Achsel nur eine mediane männliche Blüte anwesend ist, und dass diese männliche Blüte schief aufgerichtet und mit ihrer Oeffnung wagerecht nach aussen gewandt ist, sodass man auf Längsschnitten der Stengel auch einige fast mediane Längsschnitte der männlichen Blüte, auf Querschnitten des Stengels einige senkrecht darauf stehende Längsschnitte der männlichen Blüte, und auf Tangentialschnitten des Stengels eine schöne Reihe von Querschnitten der männlichen Blüte erhält.

Längsschnitte des Stengels mit Längsschnitten der männlichen Blüte zeigen unsere Figuren 13 und 14, von welchen 13 eine erwachsene Blütenknospe, 14 eine entstäubte Blüte darstellt. In Figur 13 sind 2 der 6 Antherenfächer getroffen, in Figur 14 sind diese Antherenfächer schon verschwunden und ist die apikale Oeffnung des Synandriums deutlich sichtbar.

Die Figuren 1 bis 8 sind Querschnitte durch einen achselständigen



Korthalsella Dacrydii. Fig. **1—8**, acht Querschnitte durch eine blütentragende Blattachsel (Präp. 446, Reihe E, Schnitte 8, 13, 16, 19, Reihe F, Schnitte 4, 7, 13, 18); **9—12**, vier Tangentialschnitte durch eine blütentragende Achsel (Präp. 416, Reihe B, Schnitt 12 links und 15 links, Reihe C, Schnitt 6 und 11); **13**, Radialschnitt durch eine blütentragende Achsel mit erwachsener männlicher Blütenknospe (Präp. 416,

jungen Blütenstand, dessen männliche Blüte noch nicht geöffnet ist. Die Figuren 1 und 2 gehen durch die 2 hinteren Perigonlappen, 3 bis 7 durch die Antherenfächer, 5 mitten durch das Synandrium, 8 durch den Blütenstiel.

Die Figuren 9 bis 12 sind Tangentialschnitte durch einen Blütenstand und zeigen Querschnitte durch die männliche Blüte. Die Figuren 9 und 10 sind instruktiv für den Bau des Perigons, 11 für die Lage der 6 Antherenfächer und der zentralen Höhle des Synandriums, 12 für die Einpflanzung der Blüte. Die Dreieckigkeit der zentralen Pore in Figur 11 weist darauf hin, dass die Antheren den Perigonlappen superponiert sind.

Die Figuren 15 bis 17 geben weitere Einzelheiten betreffs des Verhaltens der Antherenfächer in verschiedenen Stadien ihrer Entwicklung. Es ist einleuchtend, dass aus so kleinen Fächern mit so kleiner gemeinsamer Ausmündung die verhältnismässig grossen Pollenkörner nicht leicht herauskommen können. Es zeigt sich nun, dass dies durch die Formänderung der Antherenfächer gefördert wird. Während nämlich die nach der Mitte der Blüte gekehrte Wand der Fächer einschrumpft, wölbt sich die Aussenwand empor und drückt den Pollen in die zentrale Höhle. Das Emporwölben der Aussenwand wird durch die Verlängerung der umliegenden Parenchymzellen verursacht. In Figur 15 sind diese Zellen mit Bezug auf das Fach tangential gestreckt, in Figur 16 ungefähr isodiametrisch, in Figur 17 deutlich radial gestreckt.

Aus obigem ist ersichtlich, dass die männliche Blüte unserer Pflanze mit der *Korthalsella*blüte, wie LECOMTE sie beschreibt, fast genau übereinstimmt und dass unsere Pflanze also kein *Arceuthobium*, sondern eine *Korthalsella* ist. Die Umbenennung von *Arceuthobium Dacrydii* RIDLEY zu *Korthalsella Dacrydii* (RIDL.) DANSER hat inzwischen schon an anderer Stelle stattgefunden (Rec. trav. bot. néerl., 31, p. 759).

Die Entdeckung des Auswachsens der Zellen der Antherenfächerwände in der Richtung der apikalen Pore des Synandriums vervollständigt sehr schön, was LECOMTE betreffs der Ursache des Aufspringens der Antherenfächer mitteilt.

Reihe C, Schnitt 12 links); **14**, dasselbe mit geöffneter männlicher Blüte (Präp. 418, Reihe B, letzter Schnitt); **15—17**, Längsschnitte durch männliche Blüten verschiedenen Alters, die Zellen teilweise eingezeichnet, um die Volumzunahme und das Vollwachsen der Antherenfächer zu zeigen; **15**, erwachsene Knospe (Präp. 446, Reihe F, Schnitt 4), **16**, geöffnete Blüte (Präp. 424, Reihe F, Schnitt 17), **17**, entstäubte Blüte, deren Antherenfächer grössenteils von den verlängerten Wandzellen ausgefüllt sind (Präp. 434, Reihe B, Schnitt 11). Fig. 1—14 104 ×, Fig. 15—17 stärker vergrössert.

§ 6. **Bemerkung über die weibliche Blüte.** VAN TIEGHEM beschreibt die weibliche Blüte von *Korthalsella* vollständig (l.c. p. 85—86), und die von ihm beschriebene Struktur ist im allgemeinen für unsere Pflanze als richtig befunden worden. Besonders muss jedoch erwähnt werden, dass in den erhaltenen Präparaten auch die höchst eigentümlichen und merkwürdigen U-förmigen Embryosäcke hier und da sehr deutlich zu erkennen waren, mit dem einen Ende in der zentralen Parenchymmasse des Ovars, mit dem andern in der Fruchtknotenwand gelegen. Diese Uebereinstimmung bestätigt zum Ueberfluss die Zugehörigkeit unserer Pflanze zur Gattung *Korthalsella*. Dies ist darum von besonderer Bedeutung, weil HAYATA dies für seinen *Pseudixus japonicus* bestimmt verneint (Ic. pl. Formos., 5, p. 187, 188).

§ 7. **Zusammenfassung der Resultate.** Als Endresultat unserer Untersuchung ist die Tatsache festzustellen, dass die als *Arceuthobium Dacrydii* von RIDLEY beschriebene Pflanze kein *Arceuthobium*, sondern eine *Korthalsella* ist, wie es die Struktur des Blütenstandes (§ 3), der Blüten (§ 5 und 6) und des Andrözeums (§ 5) der untersuchten Art beweisen; letzteres stimmt mit der Beschreibung, welche LECOMTE gibt, überein, wenn er sagt, das Andrözeum sei aus 3 bilokulären Antheren zusammengestellt, welche so innig miteinander verwachsen sind, dass nicht mehr festzustellen sei, ob wir es mit 3 den Perigonlappen alternierenden oder diesen superponierten Antheren zu tun haben. Die Dreieckigkeit der apikalen Pore in gewissen Querschnitten (§ 5 und Fig. 11) ist jedoch ein von LECOMTE nicht beobachteter Hinweis darauf, dass wir es doch mit den Perigonabschnitten superponierten Antheren zu tun haben und dass in dieser Hinsicht also unsere *Korthalsella* eine richtige Loranthacee ist. Ein weiteres Resultat ist die Entdeckung des Auswachsens der Parenchymzellen der Antherenfächerwände, welche die Herausbeförderung des Pollens aus dem Synandrium zu erklären hilft.

Nach allem ist jedoch noch durchaus nicht klar, woher die Unterschiede in den Beschreibungen des Andrözeums von VAN TIEGHEM, HAYATA und LECOMTE stammen. VAN TIEGHEM war ein ausserordentlich genauer und geübter Beobachter, und es ist kaum anzunehmen, dass er die Verwachsung der Antheren übersehen oder sie zu beschreiben vergessen haben sollte. HAYATA's Beschreibung und Figuren sind so unzweideutig, dass man zwar ihre Interpretierung in Abrede stellen, die ihnen zugrunde liegenden Beobachtungen jedoch kaum bezweifeln kann. LECOMTE behauptet nachdrücklich, dass er kein einziges Mal eine Trennung zwischen den Antheren gefunden habe, welche die Alternanz oder Superposition der Staubfäden sicherstellen würde. Dass er ferner seinen

Beobachtungen die japanische Pflanze nicht ausschliesst, ist daraus ersichtlich, dass er in seiner systematischen Uebersicht unter den Synonymen von *Korthalsella moniliformis* (WIGHT) LEC. (l.c. p. 265) auch *Viscum japonicum* THUNB. erwähnt.

Eine Lösung dieser Frage an der Hand der Literatur ist darum unmöglich, weil weder VAN TIEGHEM noch LECOMTE genau und vollständig erwähnen, welche Materialien ihren Untersuchungen zugrunde lagen. VAN TIEGHEM gibt zwar genau an, welche Pflanze er für die Begründung seiner Gattung *Korthalsella* benutzte, dasselbe unterlässt er aber für seine Gattungen *Bifaria* und *Heterixia*; wir wissen also nicht, ob VAN TIEGHEM je das Andrözeum und die Embryosäcke der allbekannten japanischen Art untersucht hat. Bei LECOMTE, dessen Befunde weitaus am besten mit den unsrigen übereinstimmen, ist die Herkunft des Materials völlig unerwähnt geblieben. Es ist einleuchtend, dass eine weitere vergleichende Untersuchung von Arten aus dieser Verwandtschaft keineswegs überflüssig genannt werden kann.

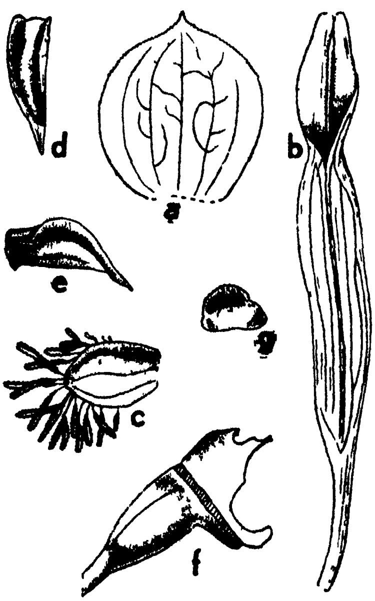
AN INTERESTING NEW BULBOPHYLLUM

by

J. J. SMITH

(Oegstgeest).

Bulbophyllum (sect. Cirrhopetalum) **Jacobsonii** J. J. S. n. sp. — Rhizoma repens, teres. Pseudobulbi remoti, oblique ovoidei, manifeste quadranguli cum lateribus concavis, 1.8 cm longi, 0.75 et 0.95 cm diam., 1-folii. Folium lanceolatum, apice recurvulum, basi brevissime conduplicato-petiolato-acuminatum, costa media supra sulcata subtus leviter obtuse prominente, carnoso-coriaceum, 9.5 cm longum, 2.9 cm latum. Inflorescentia e basi pseudobulbi, adscendens, folio paulo brevior, subumbellata, c 4-flora, pedunculo tenui, tereti, apicem versus sensim leviter incrassato, bene 10 cm longo, basi nonnullis vaginulis tubulosis, infra medium vaginula magnam partem tubulosa subulato-apiculata 0.75 cm longa donato Bracteae convolutae, inexpansae subulatae, expansae lanceolato-triangulae, usque 0.8 cm longae. Flores conspicui. Sepalum dorsale valde concavum, expansum suborbiculare, brevissime abrupte acuminatum, acutum, basi latum, praesertim versus apicem dense minute conico-papilloso-ciliolatum, 5-nervium, c. 1 cm longum, 0.75 cm latum. Sepala lateralia pedi gynostemii inserta, elongata, marginibus proximis valde incurvis inferne longitudine c. 1.8 cm conglutinata et plicam introrsam alte cariniformem formantia ceterum libera, marginibus exterioribus basi longitudine c. 0.6 cm liberis fenestram formantibus deinde incurvis et omnino conglutinatis laciniam magnam partem convexam formantia, marginibus angustissime tegentia, oblique



Bulbophyllum Jacobsonii J. J. S.
a. Sepalum dorsale.
b. Sepala lateralia.
c. Petalum.
d—e. Labella.
f. Gynostemium.
g. Anthera.

linearia, apice deficiente, basi leviter contracta, 5-nervia, 10 cm superantia, expansa una 0.73 cm lata. Petala parva, verticalia, porrecta, oblique subquingulari-elliptica, obtusa, bene dimidio superiore appendicibus (c. 27) clavatis obtusis basi brevissima filiformi excepta papillis patentissimis obtusis dense vestitis basin versus decrescentibus fimbriata, 3-nervia, 0.35 cm longa, fere 0.3 cm lata, absque fimbriis 0.225 cm longa, 0.175 cm lata, fimbriis usque 0.15 cm longis. Labellum parvum, mobile, subrectum, $^2/_5$ partibus superioribus vix obtusangule recurvum, carnosum, glabrum, supra visum anguste triangulum, parte mediana longitudinaliter convexa basi abrupte humili, margine angusto patente basin versus dilatato, marginibus apice recurvulis paululum acuminatum, satis acutum, subtus crasse carinatum cum canalicula, basi truncatum, 0.3 cm longum, 0.12 cm latum. Gynostemium breve, crassum, leviter lateraliter compressum, marginibus obtusangule dilatatis, 0.2 cm longum, clinandrio alte excavato, pariete postico recurvulo truncato, auriculis porrectis clinandrium bene superantibus, oblique lanceolatis, setiformi-acuminatis. Anthera alte cucullata, supra visa subobovata, apice rotundata, basi leviter emarginata, connectivo valde incrassato celluloso-papilloso, 0.12 cm longa. Pes gynostemii cum ovario angulum obtusum faciens, incurvus, oblongus, truncatus, carnosus, canaliculatus, apice a sepalis lateralibus liber, 0.2 cm longus. Ovarium obconicum, 6-sulcatum, 0.23 cm longum, cum pedicello multo tenuiore 0.2 cm longo clavatum, minute furfuraceo-punctatum.

S u m a t r a: West coast, Soengai Dareh, 1000 m. (A. V. THEUNISSEN, August 1924, cult. in Hort. E. JACOBSON sub n. 2202 et in Hort. Bog. sub n. 933. II. 11).

The nearest ally of this remarkable species is *B. mirum* J. J. S. from which it differs in the much longer peduncled, more-flowered inflorescences, the much larger flowers and differently shaped petals the appendages of which are densely covered with papillae. The proximate margins of the lateral sepals cohere in the basal portion and are free upwards; the exterior margins, on the contrary, are free at their base and cohere higher up so as to form a convex blade. In the cavity at the base the lip protrudes. The species demonstrates once more that a genus *Cirrhopetalum* cannot be upheld.

Dr. JACOBSON describes the colours as follows:

„Pseudobulbs green; leaves light green, waxy; peduncle greenish with purple, streaklike dots; bract greenish purple punctate; dorsal sepal greenish white dotted purple outside; lateral sepals light purple beneath greenish white at the base, inside light purple with a whitish

hue; petals greenish white fringed blackish purple; lip greenish white densely dotted light purple above, minutely punctate purple beneath; column transparently white with purple markings at the base; stigma greenish white; anther transparently white; pollinia pale yellow; ovary brownish white, pedicel greenish white, both purple dotted."

Description from a pseudobulb and an inflorescence preserved in alcohol. The tips of the lateral sepals were damaged.

THE MALAYSIAN GENUS RIGIOLEPIS HOOKER F.

by

J. J. SMITH

(Oegstgeest).

The Ericaceous genus *Rigiolepis* was founded by Sir JOSEPH D. HOOKER (Ic. plant. third ser. II (1876), 54, pl. 1160) on a single species from Borneo, viz. *R. borneensis* HOOK.F. HOOKER was not quite sure about some of the characteristics, and failed to compare it with *Vaccinium* to which genus, indeed, several authors have reduced it.

In 1914 I have discussed the *Rigiolepis* question (in Ic. Bog. IV, 68) in the note under *Vaccinium uniflorum* J. J. S. and was inclined to believe that *Rigiolepis* should be maintained as a distinct genus, although my material was not sufficient to solve the question definitely. Since I have studied many other species of this affinity and I do not hesitate to accept the genus.

H. N. RIDLEY (in Kew Bull. 1922, 106) maintains the genus also but was evidently not fully convinced of the correctness, for he says: „Several botanists have reduced the genus to *Vaccinium* but in its epiphytic habit, extra-axillary racemes, and very small flowers it is so different from typical species of *Vaccinium* that I should be unwilling to include it in that genus; if referred to *Vaccinium*, however, it and the following new species should be placed in a distinct subgenus." This argumentation I cannot participate for the characteristics summed up would not separate *Rigiolepis* from *Vaccinium*. The epiphytic habit is a very common phenomenon in *Vaccinium*. Extra-axillary racemes, so far I know the species, do not occur in *Rigiolepis* (slightly supra-axillary in *R. Endertii*) nor in *Vaccinium* but the inflorescences are produced in the leaf-axils or in the axils of fallen leaves in both genera, and smallness of the flowers can be left out of consideration as they differ, also in *Vaccinium*, considerably in size.

RIDLEY l. c. emphatically excluded *Vaccinium acuminatissimum* MIQ. from *Rigiolepis*, for he says: „By some curious error MERRILL has reduced *Rigiolepis borneensis* to *Vaccinium acuminatissimum* MIQ., with

which it has nothing in common" *). I do not understand what should be the criterium; in my opinion both species are most closely related.

H. F. COPELAND l. c. remarks, although he has apparently not seen material, that it is possible that *Rigiolepis* should be maintained as a genus „but at least neither the genus nor the species is far removed from others."

In my opinion *Rigiolepis* is sufficiently characterized by the stamens and the ovary. The stamens have in general the shape of those of *Vaccinium*; the filament is linear and often pubescent, the anther is dorsifix, produced in two moderate tubes and provided on the back with two spurs. They differ in the tubes tapering towards the apex, somewhat in the way of *Dimorphanthera*, and open by a long, longitudinal, cleftlike, introrse pore. The ovary is 10-celled, with the septa similar, complete and thin. The leaves are usually long acuminate and distinctly 3—7-plinerved but sometimes the basal nerves are rather inconspicuous so that the leaves are rather penninerved. The racemous inflorescences, as pointed out above, are produced in the leaf-axils or in the axils of fallen leaves, few- or many-flowered, rarely reduced to a single flower, solitary or fascicled, usually more or less puberulous. The bracts, bracteoles and sepals are sometimes strongly nerved. The flowers are small or very small.

There is another small group of species that perhaps best would be referable here, viz. some species of *Agapetes*. *Agapetes* as generally interpreted is a heterogenous genus. I agree with COPELAND that the nearest allies of *Agapetes setigera* D. DON may constitute a tenable genus. The others, principally Malayan, *A. Griffithii* CLARKE, *A. perakensis* RIDL., *A micrantha* RIDL., *A. Wrayi* RIDL., *A. pubescens* RIDL. and perhaps others, so far I know, differ in the corolla, quite different stamens and the 10-celled ovary. The only species I know, is the one of which I described a monstrous form with separate petals under the name of *Vaccinium dialypetalum* (in Ic. Bog. IV (1912), 99, t. CCCXXXI). Normal specimens of what I believe to be the same species were collected in Sumatra, a.o. on Kerintji-Peak. In *V. dialypetalum* the anthers are laterally cohering, which character it has in common with the true *Agapetes*-species. I do not know if it holds good also for the normal flower. The species from Kerintji-Peak was enumerated by RIDLEY in his Kerintji-list (in Journ. Fed. Mal. St. Mus. VIII (1917), 56) under the name of *A. Griffithii* CLARKE, but in 1932 in a

*) See H. F. COPELAND in Phil. Journ. Sc. XLVII (1931), 104.

letter Mr. RIDLEY kindly informed me that the Kerintji plant is *A. pubescens* RIDL. I suppose that the Javanese species also belongs here. Although the plants in question have much in common with *Rigiolepis*, I do not merge them in that genus because my knowledge of them is insufficient.

Rigiolepis HOOK.F.

HOOK.F. Ic. Plant. 3rd ser. II (1876), 54, t. 1160; DRUDE in ENGL. u. PR. Nat. Pfl.fam. IV, 1 (1897), 49, J. J. S. in Ic. Bog. IV (1914), 68; in KDS. et VAL. Bijdr. 13 Booms. Java (1914), 145; RIDL. in Kew Bull. 1922, 106; H. F. COP. in Phil. Journ. Sc. XLVII (1932), 103.

Calyx 5-partitus, laciniis persistentibus. Corolla urceolata, 5-loba, lobis in praefloratione imbricatis. Stamina 10, inclusa, aequalia, circa discum inserta, filamentis corollae basi leviter adnatis, plerumque undatis pilosisque, antheris liberis, dorsifixis, in tubulos 2 mediocres vel satis longos apicem versus attenuatos poro conspicuo longitudinali rimiformi introrso hiantes productis, dorso bicalcaratis. Ovarium inferum, cum pedicello articulatum, 10-loculare, septis aequalibus, tenuissimis, completis; stylus columnaris, stigmate parvo truncato. Bacca calyce discoque coronata, 10-locularis. Semina in loculis 1—3, satis conspicua.

Fructices plerumque epiphytici, saepe pubescentes. Folia alterna, breviter petiolata, integerrima, supra basin utrinque glandula marginali instructa, saepissime distincte raro indistincte 3—7-plinervia. Inflorescentiae axillares vel in axillis foliorum delapsiorum, raro paululum supra-axillares, racemosae, pauci-multiflorae, raro floribus ad unum reductis, solitariae vel fasciculatae, plerumque secundae, foliis multo breviores, saepe puberulae. Flores parvi vel parvuli, saepe puberuli et minute muriculati, pedicellati, pedicello bracteolato.

The genus as here interpreted is confined to Java, Sumatra and Borneo; the majority of species originate from the latter island.

The following species should be reckoned to it. I am acquainted with more species but the material at hand is not good enough to describe them. On the other hand some of the species enumerated below may prove, when good materials are available, identical with others.

Rigiolepis borneensis HOOK.F. Ic. pl. XII (1876), 54, t. 1160; COPEL. in Phil. Journ. Sc. XLVII (1932), 103; RIDL. in Kew Bull. 1922, 106. — *Vaccinium borneense* W. W. SM. in Notes Bot. Gard. Edinb. VIII (1915), 329. — *V. acuminatissimum* MERR. (non MIQ.) in Journ. Str. Br. R. As. Soc. Spec. numb. (1921), 465.

Frutex ramulis plus minusve dense hirto-puberulis, inferne squamis triangulo-subulatis interdum leviter foliaceis rigidis pungentibus dorso valde prominenter nervosis puberulis c. 0.2—1 cm longis inspersis. Folia alterna, breviter petiolata, elliptica ad lanceolata vel plus minusve ovata, acuminata vel longe acuminata, acutiuscula vel obtusa, basi acuta vel interdum obtusa, integerrima, margine recurva, glandula marginali impressa utrinque supra basin, adulta nervis supra subtusque praesertim versus basin puberulis exceptis glabra, interdum subglabrescentia, 5-plinervia, nervis valde adscendentibus, longissimis fere usque apicem productis, exterioribus interdum inconspicuis, supra in canaliculis tenuiter prominentibus subtus valde prominentibus, curvatis, intra marginem anastomosantibus, venis transversis curvatis connexis, reticulo venarum sicco utrinque prominente, supra inter nervos et interdum etiam inter venas valde convexa, coriacea, nitida, c. 7.5—15 cm longa, 1.75—5.5 cm lata; petiolus puberulus, c. 0.3—0.5 cm longus. Inflorescentiae axillares, solitariae, breves, satis multi- vel satis pauciflorae, sessiles, 1—2.2 cm longae, squamis densis imbricantibus subulatis vel triangulo-subulatis rigidis pungentibus puberulis ad basin, rachide villosulo-pubescente. Bracteae patentes, ovatae, acutae vel acuminatae, valde concavae, dorso valde prominenter nervosae, puberulae, longius ciliatae, c. 0.25—0.275 cm longae. Flores parvi, breviter pedicellati, pedicello tereti, puberulo, cum ovario articulato, 0.23—0.26 cm longo, bracteolis 2 oppositis incurvis ovato-lanceolatis acuminatis acutis concavis puberulis ciliatis nervis 3—5 validis dorso prominentibus rigidis c. 0.17—0.2 cm longis supra vel infra medium. Calyx 5-partitus, laciniis adpressis, ovato-triangulis vel oblongo-ovato-triangulis, acutis, dorso puberulis, ciliatis, dorso valde prominenter 3-nerviis, inter nervos semipellucidis, c. 0.175 cm longis, 0.075—0.1 cm latis. Corolla subovoideo- vel subovali-urceolata, basi apiceque valde contracta, 5-angulato-lobata, apice 5-lobata, puberula, c. 0.225—0.26 cm longa, 0.2—0.225 cm diam., lobis recurvis, triangulis, convexis, dorso puberulis, c. 0.04 cm longis. Stamina 10, 0.16—0.2 cm longa; filamentum lineare, papillosum, 0.07 cm longum; anthera dorsifixa, oblongo-ovato-triangula, apicem versus angustata, basi obtusissima retusa, circiter usque ad medium in tubulis 2 leviter incurvulis contiguis erectis apicem versus attenuatis obtusis poro introrso longissimo sublineari hiantibus fissa, tubulis exceptis minute echinulata, 0.075 cm longa, calcaribus 2 conspicuis erecto-patentibus incurvulis subulatis minute echinulatis c. 0.04 cm longis dorso ad basin tubulorum. Ovarium semiglobosum, patenter pubescens, c. 0.075 cm altum, 0.125 cm diam.: stylus teres, versus apicem vix incrassatus, truncatus, glaber, c. 0.2 cm longus. Discus

annulari-disciformis, margine minute lobulatus, puberulus, 0.06 cm diam. Fructus brevissime pedicellatus, laciniis calycis triangulis 0.3—0.325 cm longis discoque excavato coronatus, globosus, pubescens, maceratus c. 0.45 cm diam., 10-locularis, septis omnibus tenuibus. Semina 1—2 in loculis, compressa, oblonga, plus minusve triangula, interdum falcatula, reticulata, c. 0.16—0.17 cm longa.

Borneo: Sarawak (Native collector nrs. 1160!, 1748!, 1956!). Mt. Poi. (J. and M. S. CLEMENS n. 21962!, 8 October 1929). Mt. Matang, 700 m. (J. and M. S. CLEMENS n. 20992!, October 1929). Matang Road (Native collector DABONG nrs. 729!, 1503!). Kuching. (G. D. HAVILAND and C. HOSE n. 1020!, 27 August 1894). Wester Afdeeling. (JAHERI!, without locality and number). Boekit Singkadjang. (J. E. TEYSMANN n. 8149!). Landak Ngabang. (J. E. TEYSMANN nrs. 11514!, 11555!). Between Soengai and Goenoeng Kenepai. (H. HALLIER nrs. 1488!, 1937!, 1893—'94). Goenoeng Kelam. (H. HALLIER n. 2339!, 1893—'94). Mandor, 50 m. (E. POLAK n. 219!, 11 December 1930).

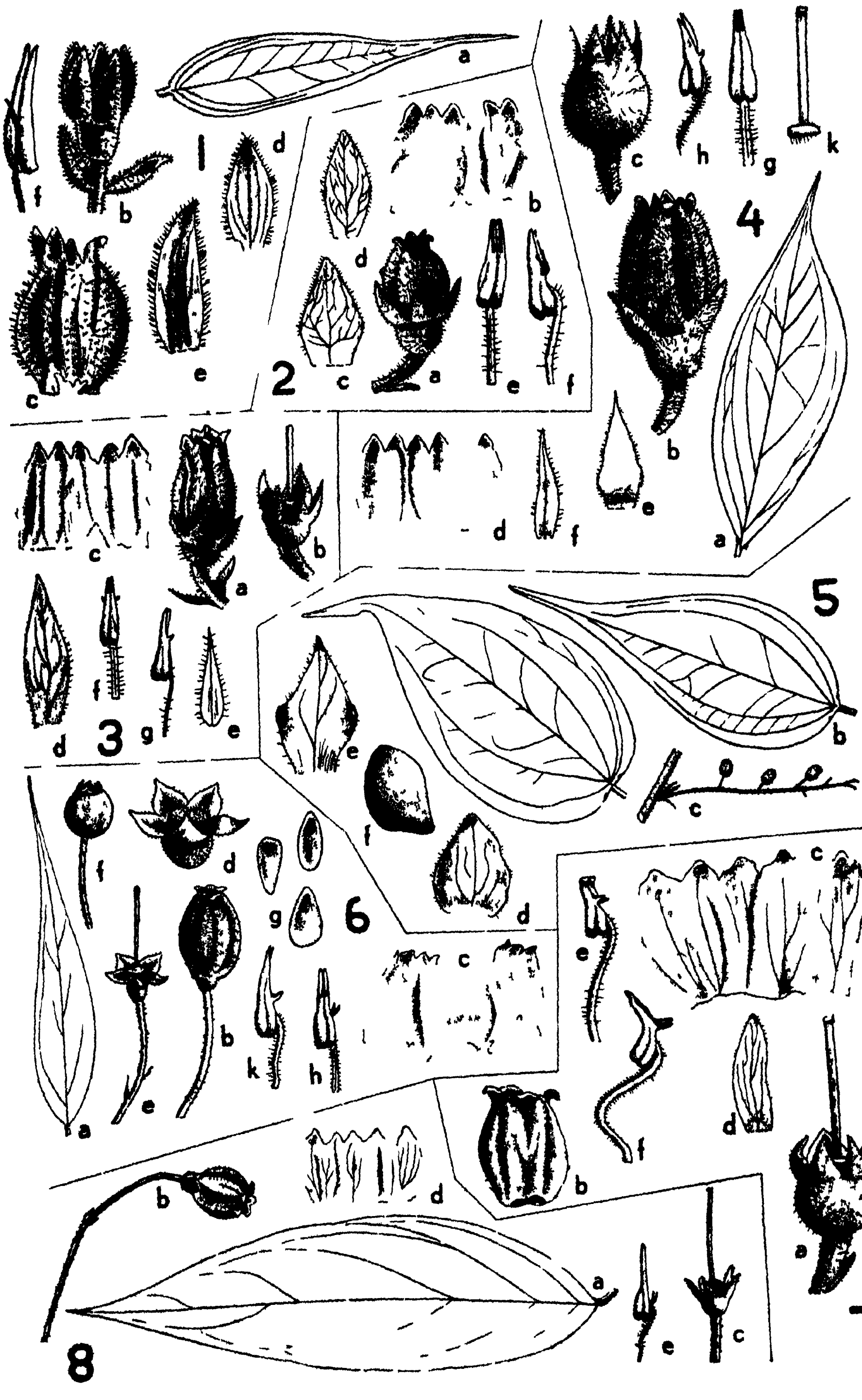
The type species has been collected repeatedly and is evidently not rare in Borneo. It is well characterized by the leaves, the manyflowered dense inflorescences and the strongly nerved bracts, bracteoles and sepals.

Among the material collected by the native collector JAHERI there are specimens with very short inflorescences and others with longer pedicelled flowers than usual.

Description from herbarium.

Rigiolepis poiana J. J. S. n. sp. Fig. 1, a—f.

Frutex ramulis longis tenuibus patentissime hirsutulis, ramentis filiformi-subulatis sicco prominenter nervosis puberulis usque c. 0.55 cm longis. Folia alterna, brevissime petiolata, ovato-lanceolata, sensim longissime caudato-acuminata, angustissime obtusa, breviter acuta, apice cartilaginea, basi rotundata vel obtusa, margine sicco recurvula, glandula marginali prominula impressa utrinque supra basin, adulta in nervis principalibus praesertim basin versus villosulo-hirsutula, 5-plinervia, ceterum plerumque nervis lateralibus patentibus tenuibus intra marginem anastomosantibus 2 vel pluribus utrinque, costa media supra in canalicula prominula subtus bene prominente, nervis basilaribus praesertim in foliis adultis basi supra in canaliculis prominulis, ceterum cum reticulo venarum supra subtusque prominulis, praesertim superioribus valde adscendentibus, coriacea, c. 5.5—10 cm longa, 1.3—2.1 cm lata, cauda 1.1—3.25 cm longa; petiolus hirsutulus, ad c. 0.4 cm longus. Inflorescentiae axillares, ut videtur plerumque solitariae, subsessiles, laxe c. 15-florae, nonnullis squamis subulatis hirsutulis ad basin, rachide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patentissime hirsutula, 4.25—6 cm longa. Bracteae ovatae, saltem inferiores acuminatae, concavae, hirsutulae, dorso prominenter nervosae. Flores pedicellati, pedicello crassiusculo, tereti, patentissime pubescente nonnullisque pilis clavatis ad apicem insperso, 0.25 cm longo, bracteolis 2 oppositis patentibus ovato-oblongis apiculatis concavis utrinque hirtello-puberulis in margine nonnullis pilis clavatis inspersis 3-nerviis firmis fere 0.3 cm longis 0.1 cm latis in medio pedicelli. Calyx 5-partitus, adpressus, laciniis oblongo-ovatis, apicem versus angustatis, acutiusculis vel obtusiusculis, utrinque pubescentibus, ciliatis, nonnullis pilis brevioribus clavatis in margine inspersis, 0.3 cm longis, 0.12 cm latis. Corolla urceolata, 5-angulato-lobata, basi fauceque contracta, apice 5-loba, intus extusque dense hirtello-puberula, extus nonnullis pilis clavatis inspersa, macerata 0.45 cm longa, lobis triangulo-ovatis. Stamina 10, 0.275 cm longa; filamentum lineare, papillosum; anthera supra basin dorsifixa, parte inferiore oblonga basi obtusissima lobulata echinulata, thecis antice sulco separatis sulco laterali instructis, in tubulos 2 erectos contiguos rectos apicem versus attenuatos producta, calcaribus 2 conspicuis filiformi-subulatis 0.05 cm longis ad basin tubulorum, tota 0.225 cm longa, tubulis c. 0.125 cm longis. Ovarium cum pedicello articulatum, bene semiglobosum, dense patentissime hirtello-pubescens, c. 0.1 cm altum, cum calyce fere 0.4 cm longum; stylus sepala superans, teres, glaber, 0.3 cm longus. Discus pulvinatus, hirtellus.

B o r n e o: Sarawak, Mt. Poi, 1700 m. (F. W. FOXWORTHY n. 395! (type), 3 June 1908). Same locality, 1300—1500 m. (J. and M. S. CLEMENS nrs. 6779!, 20006!, 20019!, 20043!, 22589!, September 1829).

Explanation of the plate.

Fig. 1. *Rigiolepis poiana* J. J. S. *a.* Folium. *b.* Flos absque corolla. *c.* Corolla. *d.* Bractea. *e.* Bracteola. *f.* Stamen. — Fig. 2. *Rigiolepis lanceolata* (Bl.) J. J. S. f. *sumatrana*. *a.* Flos. *b.* Corolla explanata. *c, d.* Bracteae. *e, f.* Stamina. — Fig. 3. *Rigiolepis lanceolata* (Bl.) J. J. S. f. *marapiensis*. *a.* Flos. *b.* Calyx et pistillum. *c.* Corolla explanata. *d.* Bractea. *e.* Bracteola. *f, g.* Stamina. — Fig. 4. *Rigiolepis lanceolata* (Bl.) J. J. S. f. *elliptica*. *a.* Folium. *b.* Flos. *c.* Fructus. *d.* Corolla explanata. *e.* Bractea. *f.* Bracteola. *g, h.* Stamina. *k.* Pistillum. — Fig. 5. *Rigiolepis Korthalsii* J. J. S. *a, b.* Folia. *c.* Racemus fructifer. *d, e.* Bracteae. *f.* Semen. — Fig. 6. *Rigiolepis salicifolia* J. J. S. *a.* Folium. *b.* Flos. *c.* Corolla explanata. *d.* Calyx cum ovario. *e.* Flos absque corolla. *f.* Fructus. *g.* Semina. *h, k.* Stamina. — Fig. 7. *Rigiolepis Endertii* J. J. S. *a.* Pistillum. *b.* Corolla. *c.* Idem, explanata. *d.* Bractea. *e.* Stamen minus. *f.* Stamen majus. — Fig. 8. *Rigiolepis filiformis* J. J. S. *a.* Folium. *b.* Flos. *c.* Flos absque corolla. *d.* Corolla explanata. *e.* Stamen.

I think that the collections cited above belong together, though good flowering material is lacking; only on the type there is a flower which, however, had already been examined by Dr. MERRILL. The type differs from the specimens collected by Mr. and Mrs. CLEMENS in the larger leaves and longer and laxer inflorescences, just as if this specimen was collected on a more shady spot.

The species differs from *R. borneensis* HOOK.F. in the much smaller, differently shaped leaves, the very hairy inflorescences and flowers, larger flowers.

Description from herbarium.

Rigiolepis lancifolia RIDL. in Kew Bull. 1922, 107.

Borneo: Sarawak, near Quop. (G. D. HAVILAND n. 619). Mount Start, 540 m. (G. D. HAVILAND n. 1462).

Rigiolepis Lobbii RIDL. in Kew Bull. 1922, 107.

Borneo: Sarawak, 900 m. (TH. LOBB).

Rigiolepis uniflora J. J. S. nov. comb. — *Vaccinium uniflorum* J. J. S. in Ic. Bog. IV (1910), 67, t. CCCXX.

Borneo: Wester-Afdeeling, Amai Ambit. (H. HALLIER n. 3296!, (type), 1893—'94).

This species without doubt belongs to *Rigiolepis*.

RIDLEY compares his *Vaccinium monanthum* with *R. uniflora* J. J. S. It is quite possible that that species belongs also in *Rigiolepis*, but as I have no certainty I do not remove it from *Vaccinium*.

Rigiolepis lanceolata J. J. S. nov. comb. — *Gaylussacia lanceolata* BL. Bijdr. (1826), 861; DUN. in DC. Prodr. VII, 2 (1840), 557; MIQ. Fl. Ind. Bat. II (1858), 1063. — *Vaccinium lanceolatum* J. J. S. in Ic. Bog. IV (1910), 68; in K. et V. Bijdr. 13 Booms. Java in Meded. Dep. Landb. No. 18 (1914), 144, KDS. Exkursionsfl. III (1912), 12. — *V. acuminatissimum* MIQ. Ann. Mus. Bot. Lugd. Bat. I (1863), 36. — *Agapetes lanceolata* NIED. in ENGL. Bot. Jahrb. XI (1890), 201. — *A. acuminatissima* NIED. l. c.

Java: Western part, Goenoeng Salak. (C. L. BLUME n. 2045!; S. H. KOORDERS n. 24469β!, 22 September 1896).

This species is well distinguished from *R. borneensis* especially by the marginal glands projecting in the way of small auricles, the longer and laxer inflorescences and the bracts, bracteoles and sepals not being prominently veined.

It appears to be confined to West-Java but in Sumatra several forms occur which are described below.

KOORDERS l. c. overlooked the fact that I adopted the name *Vaccinium*

lanceolatum for the species in Ic. Bog. IV, 68 and I did the same in Bijdr. 13 Booms. Java, 144.

f. **sumatrana**. — *Vaccinium acuminatissimum* MIQ. f. *β sumatrana* MIQ. Ann. Mus. Bot. Lugd. Bat. I (1863), 36. Fig. 2, a—f.

Frutex epiphyticus, ramulis tenuiusculis, superne flexuosis, teretibus, initio puberulis. Folia alterna, breviter petiolata, oblonga ad lanceolata, sensim longe acuminata, anguste obtusa, basi obtusa, sicco margine recurva, glandula marginali prominente excavata utrinque ad basin, adulta supra basi leviter puberula excepta glabra nitidaque, subtus puberula opaca, 7-plinervia, secundum nervos canaliculata, nervis adscendentibus, longissimis fere usque ad apicem productis, subtus prominentibus, ceterum nonnullis nervis parvis utrinque, reticulo venarum supra vix prominulo subtus obsoleto, rigida, c 4.6—9.6 cm longa, 1.8—2.9 cm lata; petiolus semiteres, puberulus, 0.15—0.35 cm longus. Inflorescentiae axillares, solitariae, subsessiles, laxe satis multiflorae, racemosae, secundae, 3.25—4.5 cm longae, nonnullis squamis subulatis puberulis ad basin, rachide dense puberula. Bracteae patentes, incurvae, concavae, ellipticae ad rhombeae, acutae vel obtusae, medio vel infra medium latissimae, ibi utrinque glandula marginali sessili donatae, puberulae, ciliolatae, c. 0.4 cm longae, 0.2—0.25 cm latae. Flores c. 15, parvi, breviter pedicellati, pedicello curvulo, tereti, puberulo, pilis crassioribus muriciformibus insperso, cum ovario articulato, 0.2 cm longo, bracteolis 2 lineari-lanceolatis puberulis ciliolatis in margine nonnullis muricibus inspersis 0.14 cm longis ad basin. Calyx 5-partitus, laciniis patentibus, ovato-triangulis, leviter acuminatis, acutis, dorso puberulis, 0.18—0.2 cm longis, 0.125—0.14 cm latis. Corolla ample urceolata, canaliculis 5 longitudinalibus valde angulato-quinquelobata, apice contracto 5-lobulata, extus praesertim in angulis puberula, intus glabra, fere 0.3 cm longa, 0.275 cm, limbo 0.175 m diam., secta et explanata 0.325 cm longa, 0.475 cm lata, lobis recurvis, convexis, triangulis, obtusis, c. 0.05 cm longis, 0.06—0.07 cm latis. Stamina 10, 0.25 cm longa; filamentum leviter sigmoideum, lineare, sparse longiuscule pilosum; anthera dorsifixa, verticalis, oblonga, apicem versus angustata, subrecta, basi obtusissima 4-lobulata, circiter usque medium in tubulos 2 erectos contiguos rectos apicem versus leviter attenuatos obtusos poro introrso longo lineari hiantes fissa, thecis antice sulco separatis sulco laterali instructis, tubulis exceptis minute echinulata, calcaribus 2 supra basin angulato-incurvis ceterum rectis erectis parallelis lineari-subulatis obtusis medium tubulorum attingentibus vel paululum superantibus dorso ad basin tubulorum, 0.125 cm longa. Ovarium semiglobosum, dense puberulum, 0.1 cm altum, fere 0.2 cm diam.; stylus teres, truncatus,

basi attenuatus, glaber, 0.3 cm longus. Discus annulari-crateriformis, extus 10-lobulatus, c. 0.1 cm diam.

Sumatra: West coast, Goenoeng Tandike and Singgalang. (P. W. KORTHALS!). Padang, Ajer Mantjoer, 360 m. (O. BECCARI n. 516!, August 1878). Bengkoeloe, Soeban Ajam. (Expedition E. JACOBSON, AJOEB n. 353!, 12 July 1916; „epiphytical, flowers white").

Differing from the type in the smaller leaves with more sunk nerves, commonly shorter inflorescences, somewhat larger flowers.

Description from herbarium.

f. **marapiensis**. Fig. 3, a—g.

Frutex, ramulis elongatis, dense pubescentibus. Folia alterna, breviter petiolata, lanceolata, sensim longissime acuminata, apice obtusa vel obtusiuscula, basi breviter in petiolum contracta, in utraque parte canaliculae longitudinalis convexa, interdum etiam secundum nervos basilares superiores leviter canaliculata, margine sicco recurva, glandula marginali prominente excavata utrinque ad basin, novella utrinque puberula, supra glabrescentia, 5-plinervia, nervis intra marginem anastomosantibus, pare secundo longe adscendente, costa media subtus prominente, reticulo venarum supra plerumque distincte prominente subtus obsoleto, tenuiter coriacea, rigida, c. 4.25—8.5 cm longa, 1.1—2 cm lata; petiolus a dorso compressus, transverse rugulosus, puberulus, 0.25—0.3 cm longus. Inflorescentiae axillares, solitariae vel interdum fasciculatae, subsessiles, racemosae, laxe multiflorae, secundae, c. 4—6 cm longae, squamis subulatis puberulis ad c. 0.45 cm longis ad basin, rachide dense puberula. Bracteae patentes, incurvae, valde concavae, lanceolatae, versus apicem angustatae, obtusiusculae, ciliolatae, c. 0.4 cm longae, bene 0.1 cm latae. Flores parvi, breviter pedicellati, pedicello curvulo, tereti, puberulo, c. 0.075 cm longo, bracteolis 2 ovato-lanceolatis longe angustatis puberulis ciliatis 1-nerviis c. 0.18—0.2 cm longis, 0.04 cm latis ad basin. Calyx 5-partitus, c. 0.25 cm diam., laciniis corollae adpressis, ovato-triangulis, acuminatis, acutis, dorso sparse puberulis, ciliolatis, 0.125 cm longis, 0.08—0.1 cm latis. Corolla ovoideo-urceolata, canaliculis 5 longitudinalibus valde angulato-quinquelobata, apice 5-lobulata, puberula, macerata secta et explanata 0.35—0.36 cm longa, 0.45 cm lata, lobis recurvis convexis triangulis obtusis 0.05—0.06 cm longis, 0.06—fere 0.1 cm latis. Stamina 10, 0.175—0.2 cm longa; filamentum leviter sigmoideum, lineare, sparse longe pilosum; anthera dorsifixa, verticalis, recta, oblonga, apicem versus sensim angustata, basi obtusissima 4-lobulata, usque ad vel paululum ultra medium in tubulos 2 contiguos apicem versus attenuatos poro parvo introrso longitudinali hiantes fissa, thecis antice sulco separatis,

tubulis exceptis minute echinulata, calcaribus 2 brevibus divergentibus anguste triangulis obtusis supra basin tubulorum, fere 0.1 cm longa. Ovarium semiglobosum, dense puberulum, cum pedicello articulatum, 0.05 cm altum, 0.13 cm diam.; stylus teres, glaber. Discus pulvinatus, medio excavatus, margine lobulatus, puberulus? Fructus subglobosus, puberulus, maceratus 0.36 cm diam.

Sumatra: West coast, Goenoeng Marapi, 1100 m, on a tree in forest. (H. A. B. BÜNNEMEIJER n. 4868!, 23 September 1918). Same locality, 1200 m, border of forest. (H. A. B. BÜNNEMEIJER n. 5010 (type!), 30 September 1918; „flowers white").

Differing from the type in the small, more leathery leaves with especially the midrib sunk.

Description from herbarium.

f. **elliptica.** Fig. 4, a—k.

Frutex, ramulis saepe plus minusve flexuosis, teretibus, verrucosis, novellis puberulis, glabrescentibus. Folia alterna, brevissime petiolata, oblique elliptica, satis abrupte anguste acutiuscule acuminata, basi angustata obtusa vel obtusiuscula, margine leviter recurvula, glandula marginali sessili lobuliformi obtusa utrinque ad basin, supra subtusque praesertim in nervis minute puberula, glabrescentia, 5—7-plinervia, nervis basalibus adscendentibus intra marginem anastomosantibus tenuibus supra in canaliculis prominentibus subtus prominentibus superioribus fere usque ad apicem productis, ceterum nonnullis nervis lateralibus parvis plerumque supra in canaliculis prominulis utrinque, reticulo venarum satis distincto utrinque vix prominulo, sicco coriacea, sordide fusca, utrinque nitidula, c. 7—13 cm longa, 2.5—4.7 cm lata; petiolus brevissimus, hirtellus, plus minusve glabrescens, rugulosus, 0.2—0.3 cm longus. Inflorescentiae axillares, solitariae vel geminatae, brevissime pedunculatae, plus minusve secundae, laxe pluriflorae, c. 3 cm longae, squamis subulatis puberulis ad basin, rachide tenui, dense fuscescente puberula. Bracteae patentissimae, incurvae, concavae, subovatae vel subrhombeae, subulato-acuminatae, interdum utrinque glandula marginali instructae, dorso puberulae, ciliolatae et nonnullis muricibus minutis in margine inspersae, c. 0.375 cm longae, bene 0.15 cm latae. Flores breviter pedicellati, cum ovario 0.48 cm longae, pedicello cum ovario articulato, tereti, puberulo, c. 0.2 cm longo, bracteolis 2 angustis lineari-subulatis apice incurvis concavis puberulis ciliolatis et in margine minute muriculatis c. 0.225 cm longis, 0.05 cm latis ad basin. Calyx patens, 5-partitus, 0.325 cm diam., laciniis triangulis, acuminato-angustatis, acutis vel obtusiusculis, dorso patentissime hirtellis, ciliatis et nonnulis muricibus

parvis in margine, 0.175—fere 0.2 cm longis, 0.08—0.14 cm latis. Corolla ovoideo-urceolata, sulcis 5 longitudinalibus sectione transversa 5-lobata, apice contracto 5-lobulata, basi contracta, patentissime puberula, macerata et subcompressa 0.375 cm longa, 0.275 cm diam., secta et explanata 0.375 cm longa, bene 0.6 cm lata, lobis triangulis, acutis vel acutiusculis convexis, 0.075 cm longis, 0.075—0.1 cm latis. Stamina 10, c. 0.25 cm longa; filamentum lineare, leviter sigmoideum, omnino patentissime longiuscule pilosum, 0.15 cm longum; anthera dorsifixa, ambitu oblongo-triangula, basi obtusissima quadrilobulata, in tubulos 2 erectos contiguos thecis longiores apicem versus attenuatos apice antice viso anguste obtusos a latere viso acutos poro elongato introrso hiantes producta, inter thecas et tubulos plerumque leviter constricta, thecis antice sulco separatis sulco laterali instructis, calcaribus 2 brevibus reversis incurvulis obtusis dorso ad basin tubulorum, tubulis exceptis minute echinulata, 0.125—0.14 cm longa. Ovarium semiglobulosum, dense hirtellum et pilis paulo crassioribus inspersum, 0.1 cm altum, fere 0.2 cm diam.; stylus teres, truncatus, glaber, fere 0.3 cm longus. Discus disciformis, vix lobulatus, vertice truncatus, breviter erecto-hirtellus, c. 0.1 cm diam. Fructus calyce erecto discoque coronatus, globosus, dense hirtellus, 0.4 cm diam., 10-loculare, septis tenuibus. Semina c. 11, oblonga, recta, 0.22—0.25 cm longa.

Simaloer: (ACHMAD n. 529 (type!), 8 July 1918; nom. ind. „lingkih$_2$ datan").

Mentawai Islands: Sipora, environs of Sioban, epiphytical in forest. (IBOET n. 538!, 29 October 1924; „flowers white").

This appears to be defined to the islands on the west coast of Sumatra. The leaves are distinctly elliptic.

Description from herbarium.

Rigiolepis Korthalsii J. J. S. n. sp. — *Vaccinium acuminatissimum* MIQ. f. *borneensis* MIQ. Ann. Mus. Bot. Lugd. Bat. I (1863—'64), 36. Fig. 5, a—f.

Frutex, ramulis teretibus, pubescentibus, lenticellis verruciformibus. Folia alterna, breviter petiolata, ovata vel lato-ovata ad lanceolato-ovata, longissime caudato-acuminata, acuta vel anguste obtusa, basi rotundata, integerrima, margine sicco recurva, glandula marginali impressa utrinque supra basin, supra glabra basi in costa media tantum pubescentia, subtus sparse punctata initio strigillosa et in costa parce patenter puberula, margine parce ciliata, 7—9-plinervia, nervis basilaribus curvatis intra marginem anastomosantibus supra in sulcis prominulis subtus bene prominentibus superioribus longe adscendentibus, reticulato-venosa, venis

utrinque prominulis, inter nervos bullata, coriacea, 4—11 cm longa, 1.7—4.2—6 cm lata; petiolus pubescens, 0.1—0.5 cm longus. Inflorescentiae (in fructu) axillares, solitariae, racemosae, brevissime pedunculatae, laxe vel sublaxe pluri- ad satis multiflorae, 0.8—6 cm longae, pluribus squamis triangulis ad elongato-subulatis puberulis usque 0.7 cm longis ad basin, rachide pubescente. Bracteae subpersistentes, ovatae ad rhombeae, obtusae vel acutae, saepe supra basin vel medio utrinque glandula marginali crassiuscula impressa instructae, parcius pubescentes et ciliatae, 0.23—0.3 cm longae, 0.15—0.24 m latae. Baccae sepalis incurvis discoque coronatae, subglobosae, parce puberulae, 0.55 cm diam., 10-loculares, pariete carnoso, septis membranaceis, loculis 1—2-spermis; pedicellus puberulus, 0.3—0.65 cm longus, bracteolis 2 persistentibus, ovato-lanceolatis suboppositis vel remotis donatus. Semina compressa, elliptica, basi acuta, lateribus convexa, 0.225—0.25 cm longa.

Borneo: Wester-Afdeeling, summit of the Sakoembang (Sekoembang). (P. W. KORTHALS, type!)

This is neither a form of *Vaccinium acuminatissimum* MIQ. nor *R. borneensis* HOOK.F. but a distinct species well characterized by the shape of the leaves. BLUME named it *Munnickia lanceolata* BL. var. *latifolia* BL. in the Leiden Herbarium.

Description from herbarium.

Rigiolepis macrophylla J. J. S. n. sp.

Frutex validus, ramulis brevissime tomentello-puberulis. Folia alterna, magna, breviter petiolata, oblongo-ovata, longe acuminata, apice anguste obtusa, basi rotundata, margine sicco recurva, glandula marginali impressa utrinque prope basin, adulta magnam partem glabra, utrinque in nervis praesertim ad basin puberula, 5—7-plinervia, ceterum penninervia, nervis lateralibus in toto 7—8 utrinque, in costam valde decurvis, valde adscendentibus bene curvatis intra marginem anastomosantibus supra in canaliculis prominentibus subtus valde prominentibus, reticulato-venosa, venis supra in canaliculis inconspicuis leviter prominulis subtus tenuiter prominulis, coriacea, supra nitida, subtus plerumque opaca, 20—30 cm longa, 6.75—9 cm lata; petiolus subsemiteres, puberulus, 0.4—0.8 cm longus. Inflorescentiae (in fructu) axillares, fasciculatae, brevissime pedunculatae, satis multi-(c. 15-)florae, rachide sicco angulata, brunneo-puberula, 3.2—3.6 cm longae. Bracteae ovatae, incurvae, concavae ad cucullato-concavae. Baccae erecto-patentes, sepalis incurvis coronatae, puberulae, pedicello puberulo, 0.45—0.5 cm longo.

Central Borneo: Boekit Batoe Lesoeng. (Exp. A. W. NIEUWENHUIS 1898—'99, AMDJAH n. 480; type!)

Although this is only in fruit I have described it as it is very characteristic in its large foliage.

A plant collected by HALLIER (n. 1281) at Soengai Semitau may belong here but the marginal glands are placed exactly at the base of the blade and somewhat prominent.

Description from herbarium.

Rigiolepis sulcata J. J. S. nov. comb. — *Vaccinium sulcatum* RIDL. in Kew Bull. 1922, 107.

Borneo: Sarawak. (O. BECCARI n. 3780). Niah. (G. D. HAVILAND and C. HOSE n. 3466). Near Kuching. (G. D. HAVILAND n. 1625).

Rigiolepis bigibba J. J. S. comb. nov. — *Vaccinium bigibbum* J. J. S. in Bull. Jard. Bot. Buit. 3e sér. I (1918), 408, t. 55.

Borneo Wester-Afdeeling, Landak, Poelau Pandjang. (J. E. TEYSMANN n. 7966!) Kapoeas. (J. E. TEYSMANN n. 7970!). Without locality and number. (JAHERI; type!). Soengai Semitau. (H. HALLIER n. 1281b!, 1893—'94). Soengai Bloe-oe. (Exp. A. W. NIEUWENHUIS 1896—'97, JAHERI n. 425!). Soengai Broenai (Exp. A. W. NIEUWENHUIS 1896—'97, JAHERI n. 714!).

The marginal glands are in this species somewhat prominent but not so distinctly as in *R. lanceolata.*

It seems that the flower described and figured in Ic Bog. l. c. was somewhat disturbed. In other flowers I found the anther tubes tapering and the spurs well developed and subulate.

Rigiolepis Moultonii J. J. S. nov. comb. — *Vaccinium Moultonii* MERR. in Journ. Mal. Br. R. As. Soc. LXXXVII (1923), 22.

Borneo: Sarawak, Upper Baram, Gunong Tembao (Temalok?), 1200 m. (J. C. MOULTON n. 6676 (type), 5 November 1920; colour of flowers Saccardo n. 26). Gat, Upper Rejang river. (J. and M. S. CLEMENS n. 21697!, 24 October 1929).

Very near *R. bigibba* J. J. S.

Rigiolepis salicifolia J. J. S. n. sp. Fig. 6, a—k.

Frutex epiphyticus, laxe ramosus, ramulis elongatis, tenuibus, saepe quaquaverse flexuosis, dense puberulis, indumento diu persistente, laxe foliatis. Folia alterna, brevissime petiolata, ovato-lanceolata ad anguste ovato-lanceolata, latiora sensim longe angusteque acuminata, angustiora sensim longissime angustato-acuminata, anguste obtusa vel acuta, basi foliorum latiorum obtusa foliorum angustiorum breviter cuneata subacuta, utrinque supra basin glandula marginali sessili instructa, adulta supra ad basin et in costa media leviter puberula glabrescentia, subtus nonnullis muricibus minutis adpressis inspersa, ut videtur glabrescentia,

5-plinervia, superne utrinque nervis lateralibus majoribus 2—3 instructa, nervis basilaribus lateralibusque erecto-patentibus, praesertim pare nervorum tertio vel quarto longissime adscendentibus, nervis majoribus supra in canalicula prominentibus subtus prominentibus, reticulo venarum supra prominente subtus plerumque minus distincto, sicco rigide coriacea sed satis tenuia, supra subnitidula sordide cinerea vel fuscescenti-cinerea, subtus magis fuscescentia, 4.8—10—9.5 cm longa, 0.8—1.6—2.35 cm lata; petiolus subteres, puberulus, glabrescens, c. 0.15—0.3 cm longus. Inflorescentiae axillares vel in axillis squamarum in ramulorum parte inferiore, solitariae vel binae, foliis breviores, brevissime pedunculatae, pluri- vel satis multiflorae, squamulis e basi dilatata subulatis ad basin et in pedunculo, rachide filiformi, puberula, 2.3—4.8 cm (fructificatione) longa. Bracteae parvae, patentes vel recurvae, incurvae, concavae, quadrangulae ad oblongae, conspicue acuminatae, ciliolatae et parce minute muriculatae, c. 0.14 cm longae. Flores c. 7—15, parvi, pedicello satis longo, tenui, puberulo et muricibus minutis clavatis insperso, c. 0.56 cm longo, bracteolis 2 plerumque remotis parvis angustis concavis puberulis in parte inferiore vel raro versus medium. Calyx 5-partitus, 0.275 cm diam., laciniis laxe adpressis, late subovato-triangulis, acutis vel leviter acuminatis, ciliolatis et minute muriculatis in margine, 0.075—0.08 cm longis, 0.1 cm latis. Corolla ovoideo-urceolata, longitudinaliter 5-plicato-lobata, apice bene contracto 5-lobata, parcissime muriculato-puberula, intus glabra, tenuis, macerata c. 0.4 cm longa, 0.3 cm diam. (compressa), secta et explanata c. 0.44 cm longa, 0.74 cm lata, lobis parvis, recurvis, convexis, triangulis, obtusis, 0.04 cm longis, 0.05—0.075 cm latis. Stamina 10, inclusa, 0.3 cm longa; filamentum lineare, versus basin paululum dilatatum, undato-sigmoideum, patentissime pilosum, 0.15 cm longum; anthera dorsifixa, introrsa, subrecta, ovalis, basi truncato-obtusa, minute echinulata, thecis antice sulco separatis sulco laterali instructis, in tubulos 2 conspicuos erectos rectos contiguos apicem versus angustatos anguste obtusos poro elongato introrso hiantes producta, calcaribus 2 conspicuis dorso ad basin tubulorum reversis falcato-adscendentibus vix divergentibus subulatis obtusiusculis minutissime echinulatis fere 0.05 cm longis, c. 0.2 cm longa, tubulis dimidium totius longitudinis paulum superantibus. Ovarium cum pedicello articulatum, turbinatum, puberulum muriculatumque, 0.07 cm altum, 0.125 cm diam.; stylus teres, glaber, 0.3 cm longus. Discus pulvinatus, radiato-10-lobulatus, pubescens, bene 0.1 cm diam. Fructus calyce discoque coronatus, globosus, praesertim basi puberulus muriculatusque, 0.45 cm diam., 10-locularis, c. 25-spermus, septis omnibus tenuibus, pedicello c. 0.9 cm

longo. Semina 2—3 in loculis, oblonga ad triangula, 0.24—0.275 cm longa.

Central East Borneo: West Koetai, Kemoel, 1800 m, epiphytical in primeval forest. (F. H. ENDERT n. 4100!, 13 October 1925; „epiphytical, calyx green, corolla dirty dark red"). Summit of the Kemoel, 1800 m, mountain-ridge, primeval forest, humus. (F. H. ENDERT n. 3988!, 13 October 1925; „fruit first yellow, afterwards orange-red"). Kong Kemoel, 1800 m, on tree in primeval forest. (F. H. ENDERT n. 4425 (type!), 20 October 1925; „shrub, flowers first yellow, afterwards red, fruit yellow").

In the shape of the flowers resembling in many respects *R. filiformis* J. J. S. but differing in the narrow leaves with partly long ascending basal nerves, larger, shorter pedicelled flowers with relatively shorter anther-tubes.

Description from herbarium.

Rigiolepis leptantha J. J. S. nov. comb. — *Vaccinium leptanthum* MIQ. Ann. Mus. Bot. Lugd. Bat. I (1863—'64), 37; J. J. S. in K. et V. Bijdr. Booms. Java, XIII (1914), 146, in Meded. Dep. Landb. No. 18. — *V. acuminatissimum* MIQ. f. *leptantha* VUYCK ex BOERL. Handl. II (1891), 263. — *Agapetes leptantha* NIED. in ENGL. Bot. Jahrb. XI (1890), 201.

Sumatra. (P. W. KORTHALS n. 468b!, n. 1251!). Karangnata. (H. O. FORBES n. 3129!, 1880).

Lingga Archipelago: Poelau Semarang, 10 m. (H. A. B. BÜNNEMEIJER n. 7517!, 17 August 1919).

Java: Goenoeng Papandajan. (P. W. KORTHALS!).

This species is well characterized by the abruptly acuminate, triplinerved leaves with the basal nerves very thin, rather obscure and long ascending, and the veins obsolete. The basal portion of the anthers is in comparison with the tubes very short.

f. **elliptica.**

Folia elliptica, longe satis abrupte obtuse acuminata, basi acuta vel late acuta, glandula marginali impressa utrinque paulo supra basin, 5-plinervia, nervis basilaribus supra tenuiter prominulis subtus vix conspicuis, costa media supra in canalicula prominula subtus leviter prominente, novella ut videtur utrinque minutissime puberula, plus minusve glabrescentia, subtus leviter punctata, sicco supra nitidissima, sordide grisea vel griseo-fusca, subtus opaca sordide fusca, 4.5—7.5 cm longa, 1.6—2.6 cm lata; petiolus semiteres, costa media in facie superiore pedicelli decurrente, tomentellus, 0.3—0.5 cm longus. Inflorescentiae (in fructu) axillares, solitariae, breves, minute puberulae.

Borneo: Sarawak, Kinabalu, Bidi cave. (J. and M. S. CLEMENS n. 20689!, 19 October 1929). Wester-Afdeeling, Goenoeng Semedoem. (H. HALLIER n. 711!, 1893—'94).

This differs from the type in the broader, less abruptly acuminate leaves.

HALLIER noted on the label: „Blätter erst durch's Trocknen lackiert").

HAVILAND and HOSE n. 984 looks very much the same like *R. leptantha*; it may be a variety or a closely allied species.

Rigiolepis Endertii J. J. S. n. sp. Fig. 7, a—f.

Frutex, ramulis tenuiter puberulis. Folia alterna, breviter petiolata, ovato-lanceolata, longissime acuminata, anguste obtusa vel saepe acuta, basi rotundata et breviter vel distinctius cuneato-angustata, integerrima, margine sicco recurvula, glandula marginali impressa utrinque supra basin, adulta supra glabrata vel basi in nervis leviter puberula, subtus magis puberula et muricibus minimis adpressis inspersa, 5—7-plinervia, ceterum nervis lateralibus 3—4 utrinque, nervis lateralibus tenuibus patentibus longe adscendentibus intra marginem anastomosantibus utrinque prominentibus sed nervis supra saepe in canaliculis sitis, reticulo venarum supra subtusque plus minusve prominulo, coriacea, supra nitida, subtus nitidula, c. 8.5—16 cm longa, 2—3.9 cm lata; petiolus supra costa a costa media decurrente instructus, transverse rugulosus, tenuiter puberulus, 0.3—0.5 cm longus. Inflorescentiae axillares vel potius paulo supra-axillares, solitariae vel fasciculatae, laxe racemosae, fere sessiles, pluri-multiflorae, nonnullis squamis subulatis puberulis ad basin, pedunculo abbreviato, nonnullis squamis breviter ovatis concavis puberulis in bracteas vergentibus donato, rachide tenui, sicco angulata, puberula, c. 2.4—4.7 cm longa. Bracteae patentissimae, oblongae, acutae vel apiculatae, concavae, ciliolatae, c. 0.24—0.27 cm longae, 0.08 ad fere 0.1 cm latae. Flores c. 10—18, parvi, pedicellati, pedicello cum ovario articulato, brevi, crassiusculo, puberulo, c. 0.15—0.4 cm (sub fructu) longo, bracteolis 2 subadpressis lanceolato-triangulis ad subulatis acutis puberulis 0.08—0.1 cm longis donato. Calyx 5-partitus, corollae adpressus, bene 0.1 cm altus, 0.23 cm diam., laciniis triangulis, acutis, parcissime muriculatis, ciliolatis, fere 0.1 cm longis, c. 0.1 cm latis. Corolla subgloboso-urceolata, plicis 5 longitudinalibus 5-angulato-lobata, apice constricta, 5-lobata, extus parcissime minute muriculata, intus glabra, macerata c. 0.4 cm longa, 0.3 cm diam., secta et explanata 0.4 cm longa, 0.74 cm lata, lobis brevibus, recurvis, convexis, e basi lata contractis, obtusis, c. 0.06 cm longis, 0.1—0.14 cm latis. Stamina 10, 0.3 cm longa; filamentum valde undato-

sigmoideum, lineare, densius satis grosse patentissime pubescens, 0.2 cm longum; anthera dorsifixa, tota oblonga, absque tubulis subquadrata, basi truncato-obtusissima 2—subquadrilobulata, in tubulos 2 incurvos cum parte inferiore angulum obtusum vel fere rectum facientes rectos contiguos apicem versus attenuatos obtusos poro longitudinali introrso hiantes parte inferiore subaequilongis producta, thecis antice sulco separatis sulco laterali instructis, calcaribus 2 reversis parallelis rectis linearibus obtusis 0.03 cm longis ad basin tubulorum, tubulis exceptis minute echinulata, tota 0.14 cm longa. Ovarium semiglobosum, minute muriculatum, 0.1 cm altum, 0.2 cm diam., 10-loculare, septis omnibus tenuibus; stylus teres, glaber, apice truncatus, 0.35 cm longus. Discus pulvinatus cum excavatione, margine inconspicue 10-lobulatus, glaber, 0.14 cm diam.

Central East Borneo: Koetai, Kemoel, 1500 m, on a narrow rocky mountain-ridge. (F. H. Endert n. 3883 (type!), 12 October 1925; „shrub, 4 m high, fruit yellow to orange"). Same locality, 1800 m, on a tree in primeval forest. (F. H. Endert n. 4479!, 22 October 1925; „shrub, fruit-galls").

This has in common with *R. filiformis* J. J. S. (Endert n. 4041) the nearly penninerved leaves but is readily distinguished by the stronger nerved, more shining leaves, the much stouter inflorescences, larger, shorter pedicelled flowers, relatively shorter anthertubes and straight spurs.

There are two kinds of anthers on the material. Those described above are probably the normal ones. The others are smaller, measuring only 0.2—0.25 cm, the anther 0.07—0.075 cm. The filaments are shorter and much less bent; the tubes and the spurs of the anther are also shorter, the tips of the former recurved. Both forms may occur in the same flower.

N. 4479 bears only fruit-galls but belongs, I think, to the same species.

Description from herbarium.

Rigiolepis caudatifolia J. J. S. nov. comb. — *Vaccinium flagellatifolium* Merr. in herb. — *V. caudatifolium* Merr. in Journ. Str. Br. R. As. Soc. 76 (1917), 103 (non Hayata in Ic. Pl. Formosa, 3 (1913), 127, t. 22); H. Copel in Phil. Journ. Sc. 42 (1930), 567.

Borneo: Sarawak, without definite locality. (Nat. coll. n. 1679, type!). Liu-Matu, Baram. (N. 2792 Bur. Sc., Nov. 1, 1914; J. C. Moulton n. 43!, 2 Nov. 1914, in fruit).

Rigiolepis filiformis J. J. S. n. sp. Fig. 8, a—e.

Frutex epiphyticus, ramis elongatis, ramulis sicco angulatis, minute

puberulis. Folia alterna, brevissime petiolata, lanceolata, versus apicem angustata, longe acuminata, acuta vel anguste obtusiuscula, basi cuneata, integerrima, margine revoluta, basi utrinque glandula marginali sessili instructa, novella utrinque minutissime puberula, adulta glabrescentia, subquintuplinervia, nervis basilaribus infimis minutis, ceterum in utraque parte costae mediae sicco supra in canalicula prominentis subtus prominentis nervis lateralibus c. 6—4 patentibus ad erecto-patentibus adscendentibus intra marginem anastomosantibus satis irregularibus tenuibus cum reticulo venarum supra subtusque prominulis, coriacea, opaca, c. 9.5—15.5 cm longa, 2.5—4 cm lata; petiolus saepe valde curvatus, subsemiteres, supra versus apicem costa media convexo-prominente, transverse rugulosus, initio minutissime puberulus, c. 0.2—0.4 cm longus. Inflorescentiae axillares et etiam e nodis ramulorum defoliatorum, solitariae ad fasciculatae, subsessiles vel breviter pedunculatae, laxe satis multiflorae, 3—5 cm longae, pedunculo usque ad c. 1 cm longo, nonnullis squamis subulatis puberulis donato, rachide filiformi, minute puberula. Bracteae persistentes, patentissimae, subnaviculari-concavae, oblongae, obtusae, ciliolatae, 0.15 cm longae, infimae e basi lata subulato- vel triangulo-acuminatae. Flores ad c. 14, parvi, cum ovario c. 0.26 cm longi, manifeste pedicellati, pedicello filiformi, sparse brevissime puberulo, c. 0.6—0.8 cm longo, bracteolis 2 parvis oppositis vel remotis adpressis anguste triangulis acutis vel subulatis concavis ciliolatis paulum vel bene supra medium pedicelli sitis. Calyx 5-partitus, corollae adpressus, 0.15 cm diam., 0.06 cm altus, laciniis triangulis, acutis vel acutiusculis, ciliolatis, 0.06—0.07 cm longis, 0.04—fere 0.05 cm latis. Corolla ovali-urceolata, fauce constricta, 5-loba, tubo sectione transversa plicato-quinquelobata, sparse brevissime puberula, 0.175 cm, limbo 0.15 cm diam., secta et explanata transverse oblongo-quadrangula, c. 0.26 cm longa, 0.45 cm lata, lobis recurvis, convexis, triangulis, obtusis, 0.05 cm longis, 0.075 cm latis. Stamina 10, c. 0.225 cm longa; filamentum undatum, lineare, ima basi excepta pilosum, 0.12—0.125 cm longum; anthera in fere $^1/_3$ supra basin totius longitudinis dorsifixa, subovalis, thecis antice sulco separatis sulco laterali instructis, basi subaequaliter 4-lobulata, echinulata, in tubulos 2 elongatos erectos contiguos rectos lineares obtusos poro introrso longissimo hiantes producta, calcaribus 2 brevibus adscendentibus subulatis obtusis dorso ad basin tubulorum, tota 0.15 cm longa, tubulis 0.1 cm longis, calcaribus fere 0.025 cm longis. Ovarium cum pedicello articulatum, bene subsemiglobosum, 0.04 cm altum, 0.07 cm diam.; stylus tenuis, teres, glaber, stigmate truncato, 0.18 cm longus. Discus satus alte pulvinatus, sulcis 10 longitudinalibus 10-costato-lobulatus,

vertice satis profunde excavatus et parce pilosus, 0.06 cm diam.

Central East Borneo: West Koetai, Bolset, 400 m, epiphytical in primeval forest along riverbank. (F. H. ENDERT n. 4041 (type!), 5 September 1925; „hanging downward, 4 m long, flowers light yellow, anthers brown").

This species resembles *R. leptantha* J. J. S. but the leaves are larger, more gradually acuminate, penninerved with the basal nerves not conspicuous and the larger sidenerves more prominent, not shining, and the inflorescences still thinner. From *R. salicifolia* J. J. S. it differs in the larger, almost penninerved leaves.

Description from herbarium and flowers preserved in spirit.

THE GENUS NYSSA IN THE NETHERLANDS INDIES

by

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The herbarium materials on which this publication is based were kindly put at the author's disposal by the Directions of the following Institutes:

(B) = the Herbarium of the Botanic Garden, Buitenzorg.
(BD) = the Herbarium of the Botanic Garden, Berlin—Dahlem.
(L) = the National Herbarium (Rijksherbarium), Leiden.
(S) = the Herbarium of the Botanic Garden, Singapore.
(U) = the Herbarium of the University, Utrecht.

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Nyssa

LINN., Sp. pl., ed. 1, 2, p. 1058 (1753); Gen. pl., ed. 5, p. 478 (1754); BENTH. & HOOK.F., Gen. pl., 1, p. 952 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 747 (1879); BOERL., Handl. Fl. Ned. Ind., I, 2, p. 655 (1890); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 257 (1898); KOORD. & VAL., Bijdr. booms. Java, 5, p. 95 (1900); GAMBLE, Man. Ind. timb., ed. 2, p. 392 (1902); KING, Journ. As. Soc. Beng., 71, II, p. 79 (1902); WANGERIN, in Engl. Bot. Jahrb., 38, Beibl. 86, p. 69—75, 85—86 (1906); in ENGL., Pflanzenr., IV, 220a, p. 8 (1910); KOORD., Exkursionsfl. Java, 2, p. 730 (1912); RIDL., Fl. Mal. Pen., 1, p. 895 (1922); KOORD., Fl. Tjib., 2, p. 234 (1923); EVRARD, in LEC., Fl. Indo-Ch., 2, p. 1195 (1923); *Agathisanthes* & *Ceratostachys* BLUME, Bijdr., 13, p. 645, 644 (1825); D. C., Prodr., 3, p. 10, 23 (1828); G. DON, Gen. hist. dichl. pl., 2, p. 657, 667 (1832); ENDL., Gen. pl., p. 1183 (1840); MIQ., Fl. Ind. Bat., I, 1, p. 838, 839 (1856); *Agathidanthes* HASSK., Cat. pl. Hort. Bot. Bogor., p. 254 (1844); *Daphniphyllopsis* KURZ, in Journ. As. Soc. Beng., 44, II, p. 201 (1875); For. Fl. Burma, 1, p. 240 (1877).

Only species:

Nyssa javanica (BLUME) WANGERIN — *Ceratostachys arborea* BLUME, Bijdr., 13, p. 644 (1825); D. C., Prodr., 3, p. 23 (1828); G. DON, Gen. hist. dichl. pl., 2, p. 667 (1832); MIQ., Fl. Ind. Bat., I, 1, p. 839 (1856); TEYSM. & BINNEND., Cat. pl. Hort. Bot. Bogor., p. 238 (1866); *Agathisanthes javanica* BLUME, Bijdr., 13, p. 645 (1825); D. C., Prodr., 3, p. 10 (1828); G. DON, Gen. hist. dichl. pl., 2, p. 657 (1832); HASSK., Aant. nut, p. 50 (1845); MIQ., Fl. Ind. Bat., I, 1, p. 839 (1856); TEYSM. & BINNEND., Cat. pl. Hort. Bot. Bogor., p. 238 (1866); *Agathidanthes javanica* HASSK., Cat. pl. Hort. Bot. Bogor., p. 254 (1844); *Nyssa sessiliflora* HOOK.F. & THOMS., in BENTH. & HOOK.F., Gen. pl., 1, p. 952 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 747 (1879); BOERL., Handl. fl. Ned. Ind., I, 2, p. 656 (1890); KOORD., in Teysmannia, 5, p. 63 (1894); HARMS, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 258 (1898); KOORD. & VAL., Bijdr. booms. Java, 5, p. 96 (1900); GAMBLE, Man. Ind. timb., ed., 2, p. 392, t. 8, ic. 6 (1902); KING, in Journ. As. Soc. Beng., 81, II, p. 79 (1902); VAN EEDEN, Houts. Ned. Ind., ed. 3, p. 152 (1906); BRANDIS, Ind. trees, p. 357, ic. 149 (1906); WANGERIN, in Engl. Bot. Jahrb., 38, Beibl. 86, p. 69—75, 85—86 (1906); DE CLERQ, Plantk. woordenb., p. 291 (1909); BOLDINGH, Cat. pl. Herb. Hort. Bogor., p. 145 (1914); RIDLEY, Fl. Mal. Pen., 1, p. 895 (1922); *Ilex daphnephylloides* KURZ, in Journ. As. Soc. Beng., 39, II, p. 72 (1870); *Daphniphyllopsis capitata* KURZ, in Journ. As. Soc. Beng., 44, II, p. 201, t. 15 (1875); For. Fl. Burma, 1, p. 240 (1877); *Nyssa javanica* WANGERIN, in ENGL., Pflanzenr., IV, 220a, p. 15, ic. 2 (1909); KOORD.-SCHUM., Syst. Verz., 1, fam. 229, p. 100 (1912); KOORD. & VALET., Atlas 1, t. 192 (1913); KOORD., in Engl. bot. Jahrb., 50, suppl., p. 302 (1914); HEYNE, Nutt. pl. Ned. Ind., ed. 1, 3, p. 402 (1917); KOORD., Fl. Tjibod., 2, p. 235 (1923); EVRARD, in LEC., Fl. Indo-Ch., 2, p. 1196 (1923); E. G. BAKER, in Journ. Bot., 62, suppl., p. 45 (1924); DEN BERGER, in Meded. Proefst. Boschw., 13, p. 148, ic. 109 (1926); HEYNE, Nutt. pl. Ned. Ind., ed. 2, 2, p. 1216 (1927); CRAIB, Fl. siam. enum., 1, p. 809 (1931); *Nyssa arborea* KOORD., Exkursionsfl. Java, 2, p. 731 (1912); *Nyssa bifida* CRAIB, in Kew Bull., 1913, p. 69 (1913); Fl. siam. enum., 1, p. 809 (1931); *Nyssa sessiflora* JANSSON., in MOLL & JANSSON., Mikrogr., 3, p. 730, ic. 223 (1918).

Dioecious. Young *twigs* terete, 2.5—4 mm thick, tomentose in the youth, less tomentose to glabrous later. *Leaves* spread (in seedlings the first pair of leaves opposite), rather densely placed, without stipules; petioles 1—3.5 cm long, 1.5—2 mm thick, flat or slightly grooved above, rounded beneath, densely appressedly hairy to glabrous; lamina oblong-

lanceolate to obovate, rarely somewhat ovate, 5—23 cm long, 2.5—8 cm broad, acute at the base, abruptly acuminate towards the apex, entire (the apical portion remote-dentate in seedlings), thinly to rather thickly coriaceous, penninervous with 8—11 pairs of lateral nerves that are straight in the basal portion, incurved and uniting at some distance from the margin, distinct above, prominent below, sparingly appressedly hairy to tomentose on the midrib and the thicker lateral nerves beneath, glabrous for the rest. *Inflorescences* pedunculate nearly globose heads in the axils of the leaves, 12—18 mm in diameter; peduncles flattened towards the apex, 0.7—5 cm long, 1—1.5 mm thick, 2—5 mm broad at the apex, densely appressedly hairy to glabrous, nearly half-way with 1—2 small opposite, sessile, acute, 3—4 mm long, 1 mm broad bracts; receptacle globose to ellipsoidal, flattened, 2—3 mm long, 3 mm thick, 4—5 mm broad, rarely with 2—4 flowers remote from the head; male inflorescence with peduncle 1.5—3 cm long and with 20—40 flowers, female inflorescence with peduncle 0.7—5 cm long and usually 3—8, rarely up to 18 flowers. Flowers subtended by one bract and 2 bracteoles together enclosing the flower-base, all of them broadly ovate 2—2.5 mm long, the bract 1.5—3 mm broad, the bracteoles 1.5—2.5 mm broad, up to half-way connate, all ciliate and densely appressedly sericeous on both sides; bract of the male flower 2—2.5 mm long, 1.5—2.5 mm broad, that of the female flower somewhat larger, up to 2.5 mm long and 3 mm broad; bracteoles of the female flower up to 3 mm long, 2.5 mm broad, spreading, separated and somewhat larger when fruit-bearing; *male flower* pedicellate, the pedicel nearly cylindrical, slightly obconical, 0.5—4 mm long, 0.5—2.5 mm broad at the apex, densely appressedly hairy; calyx with 4—5 rounded teeth that are 1—1.5 mm broad, 0.5—0.75 mm long, appressedly hairy outside, ciliate; petals 4—5 in number, alternating with the calyx teeth, imbricate, ovate with broad base, curled back, 3—5 mm long, 1.5—3 mm broad, with very short spreading hairs on both sides; stamens 8—10 in number, in 2 alternating whorls, those of the outer whorl longer, 3—5 mm long, slightly dilate at the base, those of the inner whorl 2—4 mm long; anthers nearly elliptical, 1.5 mm long, 1 mm broad, dorsifixed, opening laterally with slits, the outer loculi often larger than the inner ones; disc 1—2 mm in diameter, 0.5—1 mm high, 8—10-lobed at the margin; *female flower* sessile; calyx campanulate, 2—3 mm long, circ. 1.5 mm broad, densely appressedly sericeous, with 4—5 short irregular rounded lobes 0.5—1 mm long 2.5 mm broad, sometimes nearly entire, ciliate; petals 4—5 in number, like those of the male flower, but smaller, 3—4 mm long, 2.5—3 mm broad; stamens 8—10 in

number, in 2 alternating whorls, probably sterile, those of the outer whorl with filament 2—2.5 mm long and anther 1 mm long 0.75 mm broad, those of the inner whorl with filament 1—2 mm long and anther little developed or none; disc 2 mm in diameter, 0.5 mm high, slightly lobed at the margin, impressed in the middle; style 1, 1.5—2 mm long, 0.5—1 mm thick, with 2 divaricate or curled branches 1—2 mm long and stigmatose at the inside; ovary adnate to the calyx tube, one-celled; ovule one, anatropous, flattened, hanging, inserted near the top of the ovary. *Fruit* drupaceous, ellipsoidal, slightly flattened, 15—23 mm long, 10—15 mm broad, 7—14 mm thick, crowned by the calyx limb and the disc up to 2 mm in diameter and 1 mm high; exocarpium coriaceous, with few lenticels, glabrescent; mesocarpium spongious-fleshy; stone flattened-obovate, acute, 10—20 mm long, 5—12 mm broad, 2—6 mm thick, very hard, on one side with few tubercules above the middle and an indistinct longitudinal keel, on the other side with 5 longitudinal shallow grooves; seed with membranous spermoderm, smooth endosperm, large flat ovate-cordate cotyledons circ. 7 mm long 5 mm broad, penninervous with slightly palminervous base and a 2.5—3 mm long straight cylindrical rootlet. (Description after all the materials examined from the Malay Peninsula, Sumatra, Borneo and Java.)

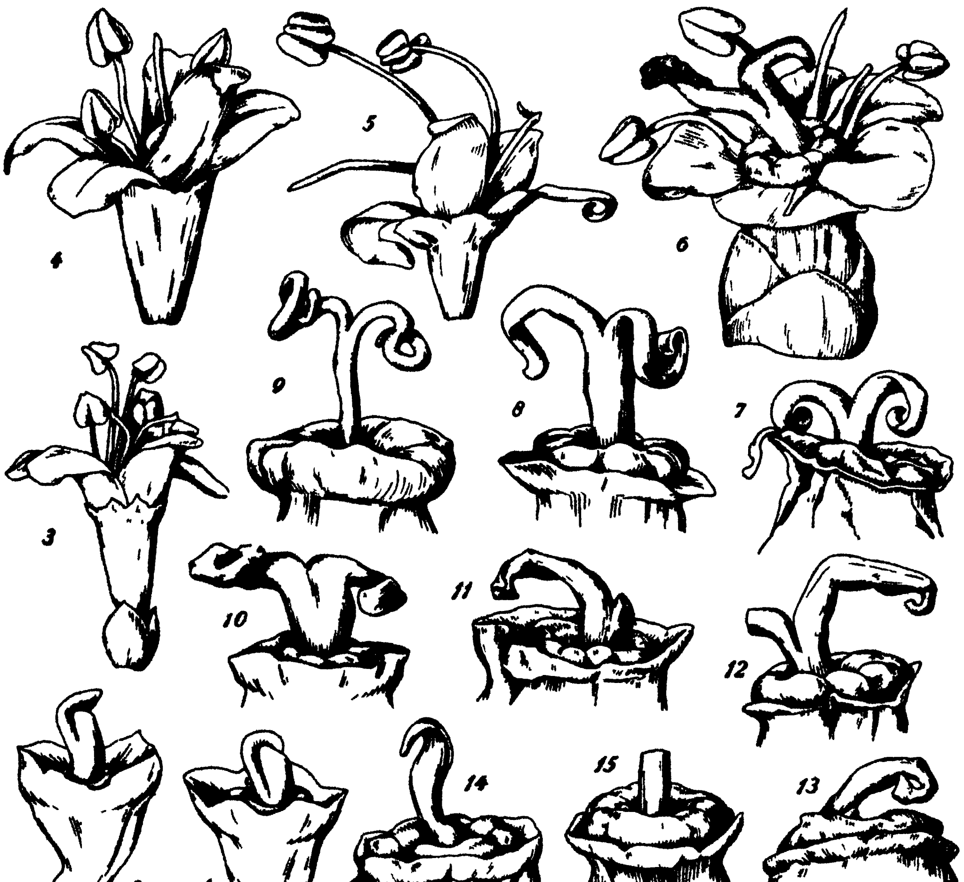
According to notes on herbarium labels *Nyssa javanica* is a tall tree often up to 30 m, sometimes even up to 40 m high, with a regular bole occupying about half the total length and with a diameter of 1—2 % of the height in the lower portion, rarely up to 1 m in diameter. Once, in a specimen from Palembang (GRASHOFF 359) buttresses are mentioned. The flowers are called greenish or whitish or yellowish, and the odour is once called agreeable, once disagreeable. The fruit is once called yellow, once wine-red, once purple-red.

The species is distributed on the Asiatic Continent from the Central and Eastern Himalayas in south-eastern direction to Annam and the Malay Peninsula, and moreover in Sumatra, Java and Borneo. In the area dealt with it has been collected at altitudes of usually 600—1540 m, but once it is recorded from only 100 m elevation. CRAIB mentions one specimen from Siam from 100 m altitude, whereas it appears to occur in the Himalayas at much higher elevations (up to 2400 m according to HOOKER F.).

The polymorphy of the materials extant of *Nyssa javanica* suggests that perhaps there might exist more than one species in the area, as was already considered by KOORDERS and VALETON (Bijdr. booms., 5, p. 98, 101) on account of the variability of the fruit. It is therefore

that the present author especially has paid attention to the characters of the flowers, about which there are found many descrepancies in literature.

BLUME mentions for *Agathisanthes* that the *male* flowers have no



Nyssa javanica. Fig. 1—2, female flower-buds, the petals and stamens taken away (KOORDERS 15359β); 3—5, male flowers (ENDERT 3179, BOSCHPR. S. W. K. III. 20 and BB. 6708); 6, female flower (cult. in Hort. Bog. sub VII. F. 1); 7—10, female flowers, without petals and stamens, the styles and stigma intact (WRAY 1617, BOSCHPR.BB. 1969, HANSEN 159, UHL 5811a); 11—14, idem, with one style branch broken off (KOORDERS 27701β, WRAY 422, BLUME s.n. from Poelasari, KOORDERS 1315β); 15, idem, both style branches broken off (BOSCHPR.BB. 1969). All figures 10 ×.

petals. The present author, however, always found 4 or 5 petals in them (fig. 3—5).

According to BENTHAM & HOOKER F., CLARKE, KING and BOERLAGE, there are, in the female flower, no petals at all or only small ones;

according to BLUME, MIQUEL and RIDLEY, there are no petals at all. After BENTHAM & HOOKER F., CLARKE, KING and BOERLAGE stamens are entirely lacking; by BLUME, MIQUEL, RIDLEY and EVRARD stamens are not mentioned. According to KURZ (J. As. Soc. Beng., 44, II, p. 201) and WANGERIN (in Engl., Pflanzenr.) the style is „perbrevis, simplex", whereas HARMS mentions an undivided style among the generic characters. After BENTHAM & HOOKER F., CLARKE, KING and BOERLAGE the style is cylindrical, undivided or shortly bifid.

The present author always found, in female flower buds and in very young female flowers, 4 or 5 petals and 8—10 stamens; in older flowers, however, he found less or none; this suggests that petals and stamens, if originally present, soon fall off in the female flowers (fig. 6). In flower buds, the style appeared to be always bifid, with one branch longer and incurved over the other (fig. 1—2). In open flowers, however, there occurred either styles deeply bifid (fig. 7—10) or such with only one branch (fig. 11—14), or even with no branches at all (fig. 15), but in the latter cases there were scars where the branches apparently were broken off. Though in the cases where only one style branch was present there was often resemblance with the figures of styles given by WANGERIN for *Nyssa ogeche* MARSH. (in ENGL., Pflanzenr., IV, 220a, ic. 1, C, D, E), the present author supposes that all authors describing undivided styles in *Nyssa javanica* have been mislead by styles with the branches broken off.

CRAIB mentions, besides *Nyssa javanica*, a new species called by him *Nyssa bifida* (Kew Bull., 1913, p. 69), for the female flowers of which he does not mention stamens, whereas the style is described as „1.5 mm altus, ramis stylo subaequilongis", and about which in his Florae Siamensis Enumeratio he says: „The markedly bifid styles afford a ready distinguishing mark for this species". As CRAIB's description hardly differs from our specimens it seems most probable that this botanist may have distinguished specimens with style branches broken off as *Nyssa javanica*, and specimens with intact style branches as *Nyssa bifida*.

Yet there is variability in the shape of the style. In general the style is rather thickly, nearly 1—2 × as long as thick, and with little curled branches (fig. 1—2, 6—8, 10—15), but in 3 Sumatra specimens (HANSEN 159, BOSCHPR.BB. 8630 & 1969) the style appeared to be slender, 3—6 × as long as thick, and with thin, strongly twisted branches (fig. 9). The characters, however, of the other parts of these specimens did not allow the distinction of a separate species or variety.

BRANDIS (Indian trees) describes the inflorescences as dense globose

pedunculate heads, „these in short axillary pubescent panicles, often solitary near the ends of the branches", and in fig. 149 he gives a flowering twig bearing in one axil 2 pedunculate heads, in another a dichotomous peduncle bearing 2 heads. Among the materials examined by the author there was no specimen at all with any branched inflorescence, but always one pedunculate head in each axil.

The fruit of *Nyssa javanica* is often deformed to a gall. On specimens bearing such fruit BLUME based his *Ceratostachys arborea,* transferred into *Nyssa* by KOORDERS under the name *Nyssa arborea.* For the rest the oldest name for our species is *Agathisanthes javanica,* the oldest name in the genus *Nyssa* is *Nyssa sessiliflora.* KURZ first described the species, wrongly, in the genus *Ilex,* and later transferred it into the new genus *Daphniphyllopsis.* WANGERIN was the first to form the combination necessary according to the modern rules of nomenclature.

MALAY PENINSULA. Perak: Gunong Batu Puteh, 1020 m el., WRAY 422 (BD, ♀), WRAY 1617 (B, S, ♀); Pahang: Fraser Hill, 1200 m el., HENDERSON & NUR 11169 (S, ♀) and Herb. Fed. Mal. St. Mus. 11465 coll. HENDERSON (B, ♀).

SUMATRA. Karo-plateau, Lau Boeloeh, 100 m el., BOSCHPR.BB. 11970 (B, o), v.n.: *kalimbangbang*; Tongkoh, 1500 m el., BOSCHPR.BB. 6827 (B, o), v.n.: *boenga sempah*; Teungkeh, 1400 m el., HANSEN 159 (B, L, ♂, ♀), v.n.:*djamboe-djamboe*; near Laut Kawar, 1500 m el., BOSCHPR.BB. 8630 (B, L, ♀), v.n.: *sangketan benang*; Toba-plateau, near Pandoemaän, 900 m el., BOSCHPR.BB. 5694 (B, L, ♀), v.n.: *modang sangkotan,* fruit yellow, with sweet odour and bitter taste; Kampoeng Hoeloe-air near Pajakoemboeh, 1000 m el., BOSCHPR. S. W. K. III. 20 (B, ♂), and BOSCHPR.BB. 6708 (B, ♂), v.n.: *madang toei*; Doesoen Moeara Padang near Pajakoemboeh, Kampoeng Si Baladoeng, 1540 m el., BOSCHPR.BB. 6490 (B, L, ♀); Bengkoeloe-Lebong, Doesoen Tandjoeng Batoe Talang meranti djedjar, 800 m el., BOSCHPR.BB. 1969 (B, ♀), v.n.: *medang sepat*; *ibidem,* BOSCHPR.BB. 1970 (B, o), v.n.: *medarah*; near Doesoen Kotadonok, 600 m el., BOSCHPR.BB. 2023 (B, ♀); Redjang, Kepahiang, alt. 650 m, BOSCHPR.BB. 15938 (B), v.n.: *medang tai kambing;* Bengkoeloe-Kroë, near Doesoen Kotabesi, 900 m el., BOSCHPR.BB. 4098 (B, o), v.n.: *talas tjalih*; Kota Bonglai, BOSCHPR.BB. 10303 (B, o), v.n.: *talas sowa-ba*; *ibidem,* BOSCHPR.BB. 10307 (B, o), v.n.: *patjar kidang*; Palembang, Moelak Hoeloe, 800 m el., GRASHOFF 359 (B, o), v.n.: *medang drian idjang,* tree 40 m high with trunk up to 1 m thick, and with buttresses nearly 1.5 m high; Pasemahlanden, Pg. Oebar, 1000 m el., BOSCHPR. T. B. 215 (B, L, o), v.n.: *medang bambang koening*; Airangat, foot of Goenoeng Kaba, 600 m el., FORBES 2880 (L, ♀), v.n.: *rawe-rawe.*

BORNEO. East-Borneo, Long Petah, 700 m el., ENDERT 3179 (B, ♂), tree 30 m high, 1 m thick.

JAVA. Without exact locality: BLUME s.n. (B, BD, L, U) at least party originals of *Agathisanthes javanica* Bl., and of *Ceratostachys arborea* BL.; Banten, Poelasari, VAN HASSELT (L, ♀), v.n.: *hoeroe rebing*; Goenoeng Karang, near Poelasari, 1050 m el., KOORDERS 1325 β (B, o), and 1075 m el., KOORDERS 1326 β (B, L, ♀), v.n.: *heroeng*; Goenoeng Tjisalak, Pasirtengah, ARSIN 19536 H.B. (B, o), v.n.: *hiroeng*; G. Salak, BLUME s.n. (L, ♀), originals of *Agathisanthes javanica* BL., v.n.: *hirung*; G. Salak, KOORDERS 24162 β (B, ♀), v.n.: *hiroeng* (N.B., the same number is enumer-

ated for Tjibodas in KOORDERS, Fl. Tjib., 2, p. 235); G. Salak, near Kampoeng Bobodjong, 650 m el., KOORDERS forest no. 147*, herb. no. 24170β (B, L, ♀), v.n.: *hiroeng*; Parakansalak, and G. Endoet, WARBURG 3289 (BD, o), v.n.: *kihiroeng*; G. Gedé, forest Kebonpodjok, 1200 m el., tree no. 12, UHL 5811a (B, L, ♀), v.n.: *kiroeng*; from the same tree LOS 5811a (B, ♀), KRAMER 5811a (B, ♀); *ibidem*, tree 19, KRAMER 5811 (B, ♂); Tjibodas, coll.? 1318β (L, o); Pasir Kramat, Kp. Tendjolaja Tjisaät near Soekaboemi, UHL 6591 (B, ♀), fruit dark-wine-red, v.n.: *hiroeng*; Takokak, 1050 m el., KOORDERS 1317β (B, ♀); forest no. 2037a, with herb. no. 1311β (B, o), 1312β (B, o), 11919β (B, ♀), 25651β (B, L, o), 32796β (B, o), v.n.: *hiroeng*; forest no. 2042a, with herb. no. 1313β (B, ♀), 1314β (B, BD, L, ♀), 1315β (B, BD, L, ♀), 1316β (B, o), 11920β (B, o), 15323β (B, o), 25818β (B, o), 32800β (B, o); forest no. 2362a, with herb. no. 15322β (B, ♀), 32694β (B, o); forest no. 2372a, with herb. no. 15203β (B, L, ♂); forest no. 2380a, with herb. no. 32722β (B, o); forest no. 2396a, with herb. no. 15359β (B, L, ♀), 15759β (B, L, ♀), 25668β (B, ♀); forest no. IIw, with herb. no. 1321β (B, ♀), 1322β (B, ♀), v.n.: *hiroeng*; Tjigenteng, KOORDERS forest no. 2167a, with herb. no. 4529β (B, o), 9895β (B, o), 24499β (B, ♂), v.n.: *kihongè*; forest no. IIw, herb. no. 1320β (B, L, o); Kampoeng Tjigoeloedoeg, near Bandoeng, 1050 m el., BOSCHPR. Ja. 1498 (B, o), v.n.: *hiroeng*; G. Papandajan, KORTHALS s.n. (L, ♂); G. Slamet, forest Bentjana (Tegal), KOORDERS 1323β (B, o); G. Prahoe, above Soerdjo, KOORDERS 1329β (B, o), 11250β (B, o); G. Telamaja, KOORDERS forest no. 682, with herb. no. 27701β (B, ♀), v.n.: *sengi*; forest no. 2228i, with herb. no. 9967β (B, L, o), forest no. 2247i, with herb. no. 9969β (B, o), v.n.: *wijoeng*; forest no. 2290i, with herb. no. 9968β (B, L, o), v.n.: *serid*; forest no. 2409i, herb. no. 9971β (B, L, ♀); forest no. 2242i, with herb. no. 9973β (B, L, o); 1300 m el., for. no. 2470, herb. no. 35789β (B, L, ♀); Koedoes, near Desa Ternadi, 800 m el., BOSCHPR. Ja. 1804 (B, o), v.n.: *gedangan*; G. Kawi, Sengon, WARBURG 3973 & 3977 (BD, ♂), v.n.: *bedali*; G. Argapoera, N.W. slope, 1200 m el., BACKER 13121 bis (B, ♂); G. Idjen, forest Pandjoes, 1000 m el., KOORDERS 14386β (B, L, ♀); forest no. 3487, herb. no. 32464β (B, L, ♀); Ragadjampi, KOORDERS 10085β (B, o), v.n.: *tandjang goenoeng*.

Moreover cultivated in the Buitenzorg Botanic Garden under VII. F. 1 (B, L, ♀); seedlings cultivated at Tjiomas, near Buitenzorg, from a specimen from Tendjolaja, Tjisaät, Soekaboemi, are in the seedling herbarium of the Boschproefstation under no. 2993 (B); idem, from a specimen from Kebon Podjok, Soekaboemi, sub no. 1862 (B).

Species reicienda.

Nyssa Hollrungii K. SCHUMANN, in SCHUM. & LAUTERB., Nachtr. Fl. deutsch. Schutzgeb. Südsee, p. 334 (1905) = **Alangium javanicum** (BL.) WANGERIN var. **papuanum** (MELCH. & MANSF.) BLOEMBERGEN, in Blumea, 1, p. 284 (1935).

B L U M E A

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THE COMPOSITAE OF THE MALAY ARCHIPELAGO.

I. VERNONIEAE AND EUPATORIEAE

by

JOSÉPHINE TH. KOSTER.

(Leiden).

CONTENTS.

GENERAL PART

Introduction.

The region, from which the *Vernonieae* and the *Eupatorieae* have been worked out, includes the Greater Sunda Islands, the Lesser Sunda Islands and the Moluccas. It is a well-known fact, that the Malay Peninsula and the Philippines have a flora, which is related to that of the Malay Archipelago, *sensu stricto*, belonging to the same region indeed. The *Compositae* of these parts have, however, been recently dealt with by RIDLEY (Fl. Mal. Pen. II, 1923, 177) and by MERRILL (Enum. Phil. Flow. Pl. III, 1923, 591) respectively, whereas those from New Guinea, which is floristically less related to the Malay Archipelago, have been worked out by MATTFELD (Engl. Bot. Jahrb. LXII, 1929, 386).

The material, used for this paper, chiefly belongs to the National Herbarium (Rijksherbarium), Leiden (L), the Herbarium of the Botanical Gardens, Buitenzorg (B) and the University Herbarium, Utrecht (U); for the rest it is to be found in the Herbarium of the Royal Botanic Gardens, Kew (K) and the Herbarium of the British Museum, London (Br. M.); some specimens of the Herbarium of the Linnean Society of London and of the Herbarium of the „Conservatoire botanique de la ville de Genève" (G) have also been studied, whereas the type specimen of *Vernonia arborea* was discovered in the Herbarium of the Royal Botanic Garden, Edinburgh. I feel greatly indebted to the Directors of these herbaria for their kindness in putting these materials at my disposal.

In vernacular and geographical names I have used the common Dutch orthography, as a rule. The Malay word for mountain, „Goenoeng", has been abbreviated to G., that for island, „Poeloe", to P., that for river, „Kali", to K., and „Soengai" (river) to S.

A ! behind the name of an author means, that I examined the specimen of the species in question, which has been studied by that author. In many cases this specimen was the type specimen. A ! behind a geographical name means, that specimens from the region cited have been studied by me.

The latest revision of the *Compositae* of the Malay Archipelago

is to be found in MIQUEL (Fl. Ind. Bat. II, 1856, 1), whereas an enumeration of the species has been given by BOERLAGE (Handl. Fl. Ned. Ind. II, 1899, 234).

MIQUEL mentioned 2 species of *Ethulia* (of which one probably does not occur in the region dealt with), 27 of *Vernonia* in 4 sections, 2 of *Decaneurum* (*Centratherum*), 1 of *Elephantopus*, 1 of *Ageratum*, 7 of *Adenostemma*, 2 of *Eupatorium*, 1 of *Mikania*. BOERLAGE enumerated the introduced monotypic genus *Sparganophorus* (*Struchium*) and one of the introduced species of *Eupatorium*; he considered 9 species of *Vernonia* as synonyms. The present author mentions 1 species of *Struchium*, 2 of *Ethulia*, 1 of *Centratherum*, 34 of *Vernonia* in 7 sections, 2 of *Elephantopus*, 1 of *Pseudelephantopus*, 1 of *Rolandra*, 2 of *Ageratum*, 5 of *Adenostemma*, 8 of *Eupatorium*, 1 of *Mikania*; in total 58 species have been described, of which 11 are introduced.

Taxonomical notes.

The species is considered to be the most fundamental, clearly delimited and only natural taxonomical unit, as a rule (DANSER, 1927; DU RIETZ, 1930). However, its delimitation has often been mistaken, for instance, when intermediate forms between two species, thus far considered to be good ones, are discovered. Nobody would hesitate then to combine the whole to one large polymorphic species (VELENOVSKY, 1905—1913; DU RIETZ, 1930; ROBINSON, 1934), called a syngameon by LOTSY. Thus some of the species based on very scanty material (often on one specimen only) afterwards may prove to be a part of such a syngameon. As such large polymorphic species must be considered *Centratherum frutescens*, consisting of 3, *Vernonia arborea* of 12, *Vernonia cinerea* of 7, *Vernonia cymosa* of 4, *Vernonia patula* of 3 *Elephantopus scaber* of 4 and *Adenostemma Lavenia* of 4 varieties in the Malay Archipelago. These varieties agree with those of VELENOVSKY (1905—1913) and with the subspecies of DANSER (1927) and DU RIETZ (1930). The only reason for naming these units „varieties" instead of „subspecies" is the fewer change of names. Their geographical distribution is most strikingly definite in the genus *Vernonia* and especially in *Vernonia arborea*. Moreover, in Sumatra and the Philippines there are some species, closely allied to *Vernonia arborea*; in future intermediate forms may be collected, which will make necessary to combine these species with *Vernonia arborea*. *Vernonia arborea*, *Vernonia javanica* and *Vernonia celebica*, now belonging to one large and polymorphic species, formerly have been considered to be three separate species.

evidently on account of the lack of sufficient material. The same fact can be stated in *Vernonia cymosa* and *Vernonia eupatorioides*, and also in *Vernonia cinerea* and *Vernonia parviflora*. GLEASON (1905—1907) noticed similar cases in the N. American species of *Vernonia*: in polymorphic species the extreme forms have often been considered as species for themselves. The varieties of the above-mentioned species are, like the subspecies of DU RIETZ (1930), not definitely delimited.

Former syngameons in *Vernonia* may have been the section *Congestae* and the Malay species of the section *Decaneurum*, both of them consisting of closely allied species with a definite area. No intermediate forms have been found here.

BENTHAM (1873) and SMALL (1917—1919) have given historical reviews of the literature concerning the *Compositae*. The classification of CASSINI, more or less followed by BENTHAM (1873) has still been maintained and is chiefly followed by HOFFMANN (1894).

Vernonia is a large and very difficult genus, of which EKMAN (1914) remarks: „all delimitation of taxonomical units in *Vernonia* is extremely difficult, from that of the species up to the genus". Though the Malay species of *Vernonia* are fairly well distinguishable, as a rule, some of them show a great variability. Sections of *Vernonia* have been distinguished by DE CANDOLLE (1836), BENTHAM (1873) and HOFFMANN (1894). HOOKER (1882), however, states: „I have found it impossible to classify the Indian *Vernonias* under the commonly recognized sections of the genus in the Genera Plantarum". Yet it seems desirable to maintain the sections, because of the unmistakable relations in certain groups of the species of *Vernonia*.

The sections of *Vernonia* in the Malay Archipelago show transitions into each other and are not always easy to delimit. Transitions are to be found between *Claotrachelus* and *Tephrodes, Claotrachelus* and *Cyanopis, Claotrachelus* and *Lepidella*, between *Cyanopis* and *Lepidella, Cyanopis* and *Strobocalyx* and between *Strobocalyx* and *Decaneurum*.

According to BENTHAM (1873) the Old World sections *Cyanopis, Lepidella* and *Tephrodes* deviate very much from the other sections. They might have been considered together as a separate genus, but they agree with the tropical American section *Lepidaploa*, except as to the typically shaped achenes.

The species of the section *Strobocalyx* have fairly uniform achenes with a pappus, consisting of broad and coarse hairs, as a rule. In this section we find species with a biseriate pappus, as well as species with a uniseriate pappus or with a pappus, which is undistinctly biseriate.

The section *Lepidella* is to be distinguished by the paleaceous outer pappus row. *Vernonia albifolia* of this section is closely allied to *Vernonia patula*, belonging to the section *Cyanopis*; it is to be distinguished, however, by the biseriate pappus. *Vernonia Junghuhniana* is a species of the section *Lepidella*, that had become lost, since its specimens have been mixed up with those of *Vernonia cinerea* in various herbaria. *Tephrodes* is not a very distinct section with a biseriate setaceous pappus. *Vernonia patula* and *Vernonia moluccensis* seem to be intermediate forms between *Vernonia* and *Centratherum*. Accordingly, LESSING (in Linnaea 1829, 320) placed *Vernonia patula* in the genus *Centratherum*. These *Vernonia* species, however, have much smaller heads, achenes with fewer ribs and no outer involucral scales, which are foliaceous. They agree with *Centratherum* in the prominently ribbed achenes and in the single caducous row of pappus-hairs, whereas *Vernonia*, as a rule, has a biseriate pappus, of which one row at least is permanent. GLEASON (1905—1907) and EKMAN (1914) have severed *Vernonia chinensis* (*Vernonia patula*) from the genus *Vernonia* (reinstating the genus *Cyanthillium* of BLUME, 1825), on account of its 4—5-angular achenes and its uniseriate, caducous pappus. In other sections of *Vernonia*, however, we find also a uniseriate pappus and 4—5-angular achenes. Thus there is no reason to keep *Vernonia patula* and the closely allied *Vernonia moluccensis* apart from the genus *Vernonia*. It is desirable, however, to split up the section *Cyanopis*, to which these two species belong, into two sections. For one of these the name *Claotrachelus* is proposed (in accordance with one of its species *Claotrachelus rupestris* of ZOLLINGER, 1845); the species belonging to this section are distinguished by a biseriate pappus, whereas the species with a uniseriate caducous pappus must be placed in the section *Cyanopis* (s. str.). The section *Claotrachelus* agrees with *Tephrodes* in the biseriate, setaceous pappus, though the setae of the outer row are flattened and very short. The species of the section *Claotrachelus* have angular achenes like those of the sections *Cyanopis* and *Lepidella*. The three species of the section *Decaneurum* in the Malay Archipelago are closely related. When more material of all three species will have been collected, it may appear necessary to combine them to one polymorphic species. *Vernonia obovata* (*Vernonia cuneata*) has been placed by DE CANDOLLE (1836) in the genus *Decaneurum* together with *Centratherum*, although in a different section. As a matter of fact both have a uniseriate pappus and oblong, ten-ribbed achenes. They are quite different, however, by the outer involucral scales, which are foliaceous in *Centratherum frutescens*, but

in *Vernonia cuneata* they are bracteaceous like the inner ones. The new section *Congestae* is characterized by the small glomerules of small few-flowered heads; it is hardly related to the other sections of *Vernonia* in the Malay Archipelago. It might even be considered as a genus of its own. MIQUEL was the only one, who described a species of this section, but he placed it in the section *Cyanopis*.

Elephantopus scaber, up to the present time considered to be pantropical, appears now to be indigenous in tropical Asia and Africa only. It is not introduced into the Malay Archipelago, as has been supposed by most authors, but it is original there. (cf. p. 460).

Only few species of the very large genus *Eupatorium* are either introduced or indigenous in the Malay Archipelago. It is not possible therefore, to check the value of its sections, but according to BENTHAM and HOOKER (1873—1876) they are difficult to separate.

Mikania cordata is the only Asiatic species of the very large, chiefly American species. The forms of this very variable species are not worthy of being called varieties, differing only in unimportant features.

In the present paper forms have been distinguished only in those cases, where one unimportant characteristic could be stated, such as differences in the dentation or the indumentum of the leaves.

The „var. typica" of a species is always based on the type specimen of the species concerned in the present paper.

Type specimens have been studied of 23 species and 10 varieties. In the present paper 1 new section, 13 new species, 14 new varieties and 3 new forms have been proposed.

The diagnoses of the species and varieties have been described in accordance with the type specimens (if they could be studied) and all the variations of the other specimens have been added. If the type specimen could not be obtained, the description was made in accordance with all specimens available.

Morphological notes.

The leaves of the *Compositae* are very variable. BENTHAM (1873) used the characteristics of the indumentum of the leaves now and then to distinguish species. In the Malay *Vernonieae* and *Eupatorieae* leaf characteristics are too variable to be of specific value, if not in connection with other features (*Vernonia, Adenostemma, Eupatorium*).

The heads are considered as compressed spikes, racemes (VELENOVSKY, 1905—1913; PARKIN, 1914) or umbels (SMALL, 1907—1909); they are

centripetal. The heads may consist of stalked, reduced heads, instead of flowers, surrounded by the involucrum (a so-called hen-and-chicken form). Such a monstrous form has been found in a specimen of *Vernonia cinerea* var. *parviflora*, collected in Banda.

In the *Vernonieae* and the *Eupatorieae* no scales are to be found on the receptacle. The receptacle rarely yields valuable taxonomical features.

Number, shape and arrangement of the involucral scales have been used by Bentham (1873) as good features for the genera. In the *Vernonieae* and *Eupatorieae* of the Malay Archipelago their shape and the number of their rows appeared to produce valuable characteristics for the sections (*Vernonia*), the species (*Vernonia, Eupatorium*) and the varieties (*Centratherum*). The involucral scales are usually considered as metamorphosed bracts of the spikes, etc. Specimens have been discovered of *Vernonia patula* var. *pubescens, Vernonia cinerea* var. *typica, Vernonia cinerea* var. *lanata* and *Vernonia arborea* var. *celebica,* where many of the heads consist of bracts only; by some cause bracts have been formed instead of the normal flower parts.

The number of flowers in a head varies from numerous to one in the *Vernonieae*. According to Gleason (1905—1907) the few-flowered heads should be primitive here; on the other hand D'O. Good (1931) considers few-flowered heads to be reduced and many-flowered heads to be primitive. In some specimens of *Vernonia cinerea* and *Vernonia cymosa* the outer achenes are longer and thinner than the inner ones and moreover sterile. Clarke (Comp. Ind., 1876, 21) has also noticed this fact. To *Vernonia cinerea* Less. var. *ludens* Clarke he added: „achenia dimorpha; alia normalia, alia (praesertim latiora) apice elongata quasi-rostrata, colore dilutiora, semine destituta. Ex Assam, Burma, Singapore adstant exempla". We may interpret this as a tendency to reduce the number of flowers in the head. Bentham (1873) noticed reductions in the number of flowers in the head to few or one in many genera. This number of flowers have been used as features for sections (*Vernonia*) and species (*Ethulia, Vernonia, Eupatorium*) in the present paper. As a rule, the flowers are sessile; a monstrous form of *Vernonia lanceolata* has been collected in Ceram, where the flowers are stalked.

We may agree with von Uexküll-Gyllenband (1901) regarding her view, that the original type of flower is the tubular bisexual one in the *Compositae*. In an early stage flowers, which afterwards become female, occasionally are bisexual (von Uexküll-Gyllenband, 1901). Accordingly, *Vernonieae* and the *Eupatorieae* have primitive corollas. The shape of

the corolla is hardly of any taxonomical value in the *Compositae* dealt with. Only in *Adenostemma* it has been used as a specific feature. In *Adenostemma* all the corollas drop together, clinging to each other by means of the hairs (YAPP, 1906; RIDLEY, 1930); at the same moment the styles drop (YAPP, 1906). In abnormal cases the corolla may be incised to the base, which has been found in a specimen of *Vernonia lanceolata.*

It is a well-known fact, that the anthers of the *Compositae* form a tube together. According to VELENOVSKY (1905– 1913) the anthers only cling to each other, but BRIQUET (1917) is convinced, that the tissues of two neighbouring anthers have grown together. In a monstrous form of *Vernonia lanceolata,* collected in Ceram, the anthers are not connate. As a rule, the anthers have apical and basal appendages. BENTHAM (1873) stated the taxonomical importance of these appendages; he does not ascribe them a function, but SMALL (1917—1919) mentioned their biological function in pushing the pollen outward. Mostly the appendages are sterile; they appear at an early stage (BRIQUET, 1917). The anthers of the *Eupatorieae* have, as a rule, an apical appendage, but no basal ones. The *Piquerinae* have no appendages at all. The genus *Vernonia* is generally considered to possess obtuse basal appendages at the anthers; however, they are often acute, as BOERLAGE (1899) and EKMAN (1914) have stated before. The pollen consists of round grains with small prickles or edges; their shape has been studied by CLARKE (1876), but appeared of little taxonomical value. The stamens of the *Vernonieae* and the *Eupatorieae* are not irritable in contradistinction to those of many other *Compositae.*

The pappus is often considered as a metamorphosed calyx (BENTHAM, 1873; TREUB, 1873; RIDLEY, 1930; D'O. GOOD, 1931): the original five sepals might have grown together with the achene and the ribs of the achene might represent the nerves of the sepals. In cases, where the pappus exists of five setae or prickles this view can be accepted, the setae or the prickles being the tips of the adnate sepals (*Elephantopus scaber, Ageratum conyzoides*). It is, however, less suitable in cases, where the number of the ribs of the achene is not a multiple of five (moreover, this number often varies in specimens of the same species) or where the pappus consists of numerous setae (*Vernonia, Eupatorium,* etc). In such cases we can better agree with another view (HIRSCH, 1901; SMALL, 1917—1919): the hairs and scales of the pappus are inserted on the rudimental rim of the calyx; then the pappus might represent the indumentum of the former calyx. According to BENTHAM

(1873) the existing or non-existing of the pappus has little taxonomical value; he considers its nature of more importance. GLEASON (1905—1907) concludes from his study of the N. American *Vernonieae*, that the structure of the pappus is often valuable as a specific feature; for the same purpose he uses the shape of the achenes. In the Malay *Vernonieae* the achenes as well as the pappus have proved to be good characteristics for distinguishing the sections (*Vernonia*) and the species (*Ethulia, Vernonia*). In the Malay *Eupatorieae* the surface and the indumentum of the achenes are used as specific features (*Adenostemma, Eupatorium*). BENTHAM (1873) and D'O. GOOD (1931) do not attach much value to the pappus as a means of dispersal of the fruit; it should be useful only for short distances. Moreover there are many widely distributed species without a pappus at all. Some of the first species, that showed themselves in Krakatau after the eruption in 1883, however, were *Compositae* with a setaceous pappus (*Vernonia cinerea, Mikania cordata*). Probably they have been transported by the wind, though partly they may have arrived by means of sea currents. RIDLEY (1930) discovered, that plumed fruits are able to go a distance up to 960 km. He considers plants with plumed fruits characteristic for open lands, moores and river banks; they should not be found in heavy rain forests. However, all species of the section *Strobocalyx* of *Vernonia*, many other species of *Vernonia*, some species of *Eupatorium* and *Mikania cordata* have in the Malay Archipelago usually been collected in forests. SMALL (1917—1919) constructed an apparatus for studying the dispersal by wind. He concluded that, if there is little moisture in the air and the direction of the wind does not change, the dispersal possibility by wind is unlimited.

In moist air, however, the pappus closes and the achene soon falls to the ground. HIRSCH (1901) noticed, that the closing of the setae of the pappus in the *Eupatorieae* is effected by cells without intercellular cavities at the base of the setae; they swell by means of imbibition. In a dry state they lose water and shrink: the setae spread out. The achenes of the genus *Adenostemma* have a sticky pappus and they may be often dispersed by means of people's clothes and hairs and feathers of animals. YAPP (1906) noticed that, as soon as the corollas have dropped in *Adenostemma Lavenia*, the glands on the tips of the setae of the pappus produce a viscid liquid. At the same time the setae move into a horizontal position, which is effected by basal swellings of the setae, consisting of cells without intercellular cavities. YAPP (1906) suggests that the movement is due to the cells, which are losing water during the

ripening of the achene. Some *Compositae*, like *Elephantopus scaber* and *Ageratum conyzoides* have pointed and rigid setae. They attach themselves to people's clothing, etc. Many achenes are very light and thus they are able to float on the water. In *Struchium Sparganophorum* the pappus seems to be suitable for making the achene float on the water. If the pappus is taken away, the achene sinks, whereas it floats as long as the pappus is extant. Moreover this species mostly has been collected near the water and thus the pappus seems important for the dispersal by water here. BAKER (Fl. Bras. VI 2, 1873—1876, 7) and RIDLEY (Fl Mal. Penins., 1923, 179) do not consider the cup, crowning the achene, to be a pappus in this species.

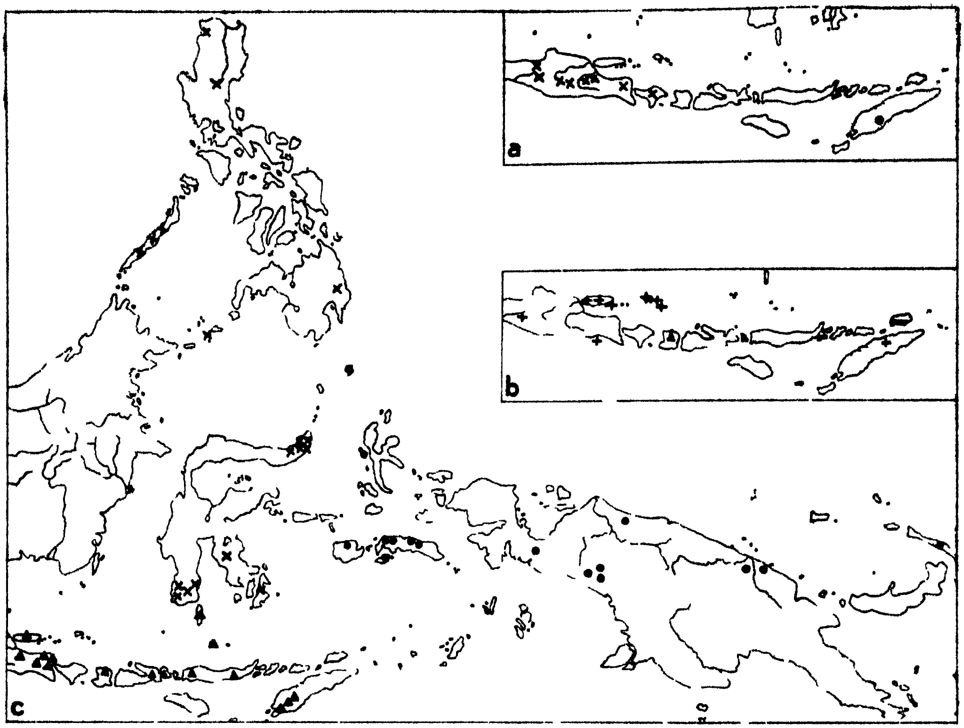
Phytogeographical notes (cf. Pl. I).

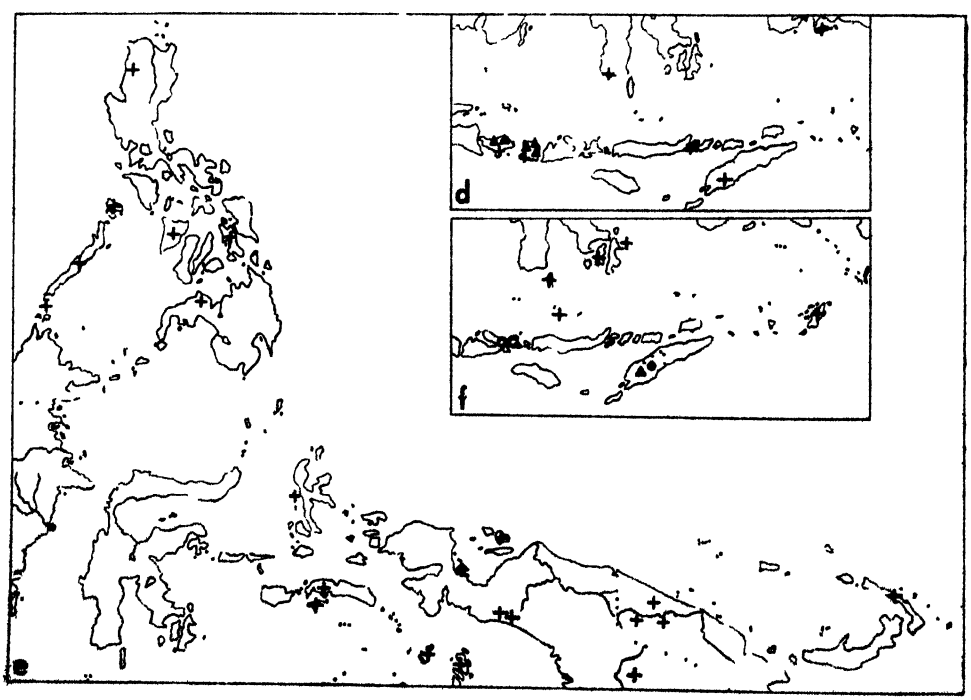
The *Compositae* are, as a rule, bad objects for phytogeographical studies, because of their easy distribution over long distances by means of their pappus (some genera like *Ethulia* excepted).

The tropical Asiatic region, to which the Malay Archipelago belongs, possesses relatively few *Compositae*. BENTHAM (1873) remarked, that no endemic genera are to be found. This view has been proved to be correct as to the *Vernonieae* and the *Eupatorieae*. However, his prophecy: „it is not probable, that future investigations will add very materially to the *Compositae* of the region", has not been confirmed, since many new species have been added to the genus *Vernonia*.

In the phytogeographic literature concerning the Malay Archipelago some floristic relations have been noticed. Sumatra is closely related to the Malay Peninsula in this respect (MERRILL, 1926). In Sumatra two species of the section *Strobocalyx* of *Vernonia* (*Vernonia patentissima* and *Vernonia durifolia*) and one of its section *Decaneurum* (*Vernonia Forbesii*) seem to be endemic. The southern (and western) part of Borneo is floristically closely related to the Malay Peninsula and Sumatra (DIELS and HACKENBERG, 1926). According to MERRILL (1926) Borneo has no great floristic relation to the Philippines. However, *Vernonia fimbrillata* probably occurs both in the Philippines (Luzon, Busuanga Island) and in Borneo, whereas *Vernonia phanerophlebia* is a species from Luzon, possessing a variety in Borneo. According to LAM (1929) Java is floristically not very similar to Sumatra. Yet *Vernonia cymosa* has been collected in Java and Sumatra only. Java has hardly any floristic relations to Borneo (LAM, 1929). *Ethulia megacephala* is chiefly a Javanese species; it has been collected in Middle and East Java and in Bali. With the exception of *Ethulia triflora* from Timor

no other species of this genus has been collected in the Malay Archipelago. Both species are mountain plants. *Centratherum frutescens* is endemic in Java. It is closely related to species of *Centratherum* from British India. *Adenostemma hirsutum* has its area chiefly in Java, but a variety has also been collected in Bali. *Eupatorium Horsfieldii* and *Vernonia Zollingerianoides* have been collected in Java only. MERRILL (1923) considers Sumatra, Borneo and Java together as one of the centres of migration, another one might be New Guinea; between these two regions we find „Wallacea", which obtained much of their floras. According to VON MALM (1934) there is no floristic unity here, as there is in the adjacent regions (called West Malesia and Papuasia by him). Wallacea or East Malesia has its own floristic centres, which might be the Philippines, Celebes, etc. As to the new section *Congestae* of *Vernonia* the Lesser Sunda Islands might be another one. However, the eastern limit of the area of the section *Congestae* goes beyond the limit, accepted for Wallacea, since a species of this section has been collected in the Tanimbar Islands. Some more species of the *Compositae* dealt with have there areas in the southern part of Wallacea. Often the western limit of these areas surpasses the western limit of Wallacea: the genus *Ethulia* and the section *Lepidella* of *Vernonia* (which have about the same distribution in the Malay Archipelago) occur from Middle Java as far east as Timor (cf. Pl. I, *a* and *b*), *Vernonia laxiflora* is to be found in Bali, Lombok and Timor (cf. Pl. I, *d*), *Vernonia moluccensis* is distributed from Bali to the Moluccas (cf. Pl. I, *d*). VON MALM (1934) supposes, that there is not a floristic boundary between Bali and Lombok, but a climatological one for hygrophilous plants only. Indeed, Lombok is much drier than Bali. The southern part of Wallacea (Lombok, nearly the whole area of Soembawa, Soemba, nearly the whole of Flores, Timor, Wetar, Roma, Tanimbar Islands, Saleier, a very small part of S.W. Celebes, Kangean Arch. and Madoera) is very dry; according to the map of rainfall types in the Malay Archipelago (LAM, 1934) there are less than 10 rainy days in the driest four months of the year. It is interesting to notice, that the areas of *Ethulia* in the Malay Archipelago (cf. Pl. I, *a*), of *Vernonia Junghuhniana* (cf. Pl. I, *b*), of *Vernonia erigeroides* (cf. Pl. I, *c*) and of the section *Congestae* of *Vernonia* (cf. Pl. I, *f*) almost exactly agree with the driest part of the Malay Archipelago. BENTHAM (1873) and recently SETCHELL (1929) pointed out, that also climatical limits may affect the distribution of plants in these parts. This might have been the case for the species concerned. We have to make an exception for the species of the genus


a
b
c


d
f
e

Ethulia, however, as they are growing on mountain slopes, which are always very moist. The habitats of *Vernonia arborea* (widely distributed all over the Malay Archipelago and the southern part of the Asiatic Continent) in Sumatra and Java are in the same time the most rainy parts of those islands, according to the maps of rainfall types in the Netherlands Indies (BOEREMA, Verh. Kon. Meteor. Obs. Bat. 14 and 24).

There is hardly any floristic relation between the Lesser Sunda Islands and Australia (VON MALM, 1934); as a matter of fact, only three or four species of the indigenous Malay *Vernonieae* and *Eupatorieae*, dealt with, occur in Australia (viz. *Vernonia cinerea*, *Vernonia erigeroides*?, *Elephantopus scaber* and *Adenostemma Lavenia*). The three species which are undoubtedly occurring in Australia are widely distributed all over the Malay Archipelago and abroad. Only *Vernonia cinerea* var. *lanata* is restricted to the Moluccas, Australia and New Caledonia.

Though no endemics of some other families (LAM, 1927, 1932) appear to occur in the Lesser Sunda Islands, yet the assertion of VON MALM (1934): „im allgemeinen ist der Endemismus nirgends im ganzen Malayischen Archipel so schwach wie gerade auf den kleinen Sunda-Inseln", could not be confirmed, as to the *Vernonieae* and *Eupatorieae*. For most of the probably endemic species have been collected in the Lesser Sunda Islands (*Ethulia triflora*, *Vernonia Tengwallii*, *Vernonia coerulea*, *Vernonia wetarensis*, *Vernonia floresiana*, *Vernonia letiënsis*, *Vernonia capituliflora*, *Vernonia Walshae*, *Vernonia timorensis* and *Adenostemma Renschii*).

We meet with a peculiar distribution in the following closely allied species: the area of *Vernonia lanceolata* (Moluccas, Talaud Islands, New Guinea, Bismarck Archipelago) belongs to Papuasia; the area of *Vernonia Elmeri* (Celebes and Philippines) belongs for the greater part to Wallacea; both areas are adjoining.

Celebes is floristically closely related to the Philippines (MERRILL, 1926) and New Guinea (LAM, 1934). *Vernonia subtilis* and *Vernonia Reinwardtiana* have been collected in Celebes only. *Vernonia kabaënsis* is endemic in an island near Celebes, Kabaena. The Moluccas are also

Pl. I.

a: *Ethulia megacephala* SCH.-BIP. ×, *E. triflora* nov. spec. ●; b: *Vernonia albifolia* KOSTER ▲, *V. Junghuhniana* nov. comb. +; c: *V. erigeroides* DC. ▲, *V. Elmeri* MERRILL ×, *V. lanceolata* (WARBG) MATTF. ●; d: *V. laxiflora* LESS. ▲, *V. moluccensis* (BL.) MIQ. +; e: *V. cuneata* LESS. +; f: *V. capituliflora* MIQ. o, *V. actaea* KOSTER +, *V. timorensis* nov. spec. ●, *V. Walshae* nov. spec. ▲

closely related to Celebes, the Philippines (MERRILL, 1926) and New Guinea (LAM, 1934). *Eupatorium Toppingianum* is restricted to the Moluccas and the Philippines. *Vernonia amboinensis* is endemic in Amboina.

All the Malay sections of *Vernonia*, except the endemic Malay section *Congestae*, are also represented in Africa, but not in America. The species of the section *Claotrachelus* occur in the eastern part of Java, the Lesser Sunda Islands and N.E. Celebes. All these species, except *Vernonia erigeroides*, are collected once and may be endemic.

The boundary of the area of the section *Decaneurum* in tropical Asia seems to be found in the Malay Archipelago. The Malay species of this section have been collected in Sumatra, the northern part of Borneo, the Philippines, the Moluccas, New Guinea and the Aroe and Kai Islands. The principal Asiatic region of this section is the southern part of the Asiatic Continent. The south-eastern part of the Malay Archipelago may be considered to be the limit of the area of *Eupatorium* in Asia. In the Malay Archipelago indigenous species of the genus *Eupatorium* are only to be found in Java, Lombok and Ceram.

The widely distributed species of the *Compositae*, here dealt with, are very variable, those with a restricted area are more or less uniform.

HILL (1929) supposes, that the primitive species of *Vernonia* have developed in Antarctica and have been distributed from there into S. America, Africa and India; from those the recent species should have evolved. GLEASON (1905—1907) accepts two centres of distribution of *Vernonia*, viz. S. America and S. Africa. It is here, that we find the most primitive *Vernonias* (GLEASON, 1905—1907; HILL, 1929). SMALL (1917—1919) takes Brazil to be the centre of the *Vernonieae*; he suggests a migration from this region along the pacific Islands.

BENTHAM (1873) takes the *Eupatorieae* to be of American origin; he noticed a great similarity between the species in the Old World and some in N.E. America. SMALL (1917—1919) supposes the centre of the *Eupatorieae* to be in Mexico.

Introduced species.

Many of the species dealt with have been introduced from America, most probably by men. *Struchium Sparganophorum* was collected for the first time in 1875 near Batavia by O. KUNTZE (BACKER, 1932). Now it is widely distributed over the Malay Archipelago. *Elephantopus tomentosus* was introduced into the Philippines from America (MERRILL, 1923). It may have been introduced from the Philippines into Celebes and Borneo. RIDLEY (1923) wonders, how this species may have arrived

in the Malay Peninsula, as it was not known to him from the Malay Archipelago. However, it seems comprehensible now, that it reached the Malay Peninsula from Borneo, but it may have been introduced directly from America as well. *Pseudelephantopus spicatus* was collected in West Java for the first time in 1917 by WEEHUIZEN (BACKER, 1932). DE CANDOLLE (1836) recorded this species already from the Philippines. *Rolandra fruticosa* was collected in Java for the first time in 1896; it certainly escaped from the botanical garden at Buitenzorg. *Ageratum* is chiefly an American genus. Two species have been introduced into the Malay Archipelago. *Ageratum conyzoides* is now distributed all over the Malay Archipelago. It was introduced here between 1812 and 1816 (ZOLLINGER, 1854) by the English (according to the natives). The natives of P. Karakelang (Talaud Islands) assured, that this species has been introduced there from Manado about 1890 (LAM, label of 2604). In 1854 it was already a dreaded weed in Java (ZOLLINGER). JUNGHUHN (1857) mentions this species as a weed in coffee estates; in his second zône (600—1350 m), wherever the primeval forests have been cut down, it is to be found in great quantities. With increasing altitude the flower colour turns from white to more and more intensely bluish violet (VAN DER PIJL, 1934). The second *Ageratum* species, *Ageratum Houstonianum*, has only been collected in Java in the Malay Archipelago. *Eupatorium* is chiefly a tropical American genus. Five species have been introduced from America into the Malay Archipelago. *Eupatorium triplinerve* was already known by BLUME (1825) to have been introduced into Java. It has been cultivated for medical purposes and has naturalised (MERRILL, 1923); it still maintains itself even after the disappearance of the natives' dwellings, near which it had been cultivated. *Eupatorium inulifolium* has been dispersed from the Java botanical gardens. BOERLAGE collected this species for the first time in 1888. Now it is widely distributed especially in West Java and it has also been collected in Sumatra and in Amboina. *Eupatorium riparium* and *Eupatorium sordidum* have undoubtedly escaped from the botanical garden at Tjibodas. In 1922 (VAN SLOOTEN) and afterwards in 1934 again a recently introduced American species has been collected in West Java: *Eupatorium adenophorum*.

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TAXONOMICAL PART

The Compositae of the Malay Archipelago.

BURM. Fl. ind. (1768) 174; WILLD. Spec. Pl. III (1804) 1477; BL. Bijdr. (1825) 885; LESS. in Linnaea IV (1829) 240; LESS. in Linnaea VI (1831) 624; LESS. Syn. Comp. (1832); ROXB. Fl. Ind. (1832) 402; DC. WIGHT Contr. Bot. Ind. (1834) 1; DC. Prod. V (1836) 4; DC. Prod. VI (1837) 1; DC. Prod. VII (1838) 263; WIGHT Ic. Pl. Ind. III (1840) t. 1076—1152; ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ. Fl. Ind. Bat. II (1856) 1; BENTH. Fl. Hongkong. (1861) 165; MIQ. Sumatra (1862) 210; BENTH. Fl. Austr. III (1866) 447; BENTH. et HOOK. Gen. Pl. II (1873—1876) 163; CLARKE Comp. Ind (1876); HOOK. Fl. Br. Ind. III (1882) 219; BAILL. Hist. Pl. VIII (1886) 1; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 87; TRIMEN Fl. Ceylon III (1895) 3; BOERL. Fl. Ned. Ind. II (1899) 147; ELMER Leafl. Phil. Bot. I (1906) 83; KOORDERS Exc. Fl. Java III (1912) 305; RIDLEY Fl. Mal. Penins. II (1923) 177; MERRILL Enum. Phil. III (1923) 591; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 488; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1429; MATTF. in Engl. Bot. Jahrb. LXII (1929) 386; ALSTON Suppl. Trimen Fl. Ceylon VI (1931) 161; HOCHREUTINER in Candollea V (1931—1934) 296; BACKER Handb. Suikerr. VII (1932) 745.

Herbs, shrubs, rarely trees, glabrous or variously pubescent, often glandular. *Leaves* opposite or alternate, entire or variously cut, without stipulae. *Flowers* congested to heads. *Heads* single, corymbose or paniculate, heterogamous (disc-flowers bisexual, rarely male, ray-flowers usually female) or homogamous (ray-flowers wanting, flowers all bisexual, rarely unisexual), consisting of one to numerous flowers, surrounded by an involucrum. *Scales of the involucrum* few or many, one- to many-seriate, variously shaped, coriaceous, membranous or foliaceous, glabrous or pubescent, often glandular. *Calyx* wanting. *Corolla* of the disc-flowers tubular or infundibuliform, having 5, rarely 4 lobes at the top, of the ray-flowers linear or filiform, corolla red, blue, violet, yellow or white. *Anthers* usually 5, alternate with the lobes of the corolla, connated, linear or oblong, two-celled, longitudinally dehiscent inside; *filaments* inserted in the tube of the corolla. *Ovary* inferior, uni-celled. *Ovulum*

anatropous. *Style* filiform, forked of the female and the bisexual flowers (branches usually covered with hairs and glands at the upper part), undivided of the male flowers. *Fruit* an achene, uni-celled, containing one seed, often crowned by a pappus. *Pappus* variously shaped, consisting of scales, setae or a cartilagineous ring, permanent or caducous, sometimes wanting. *Receptaculum* (metamorphosed tip of the peduncle) flat, conical or convex, with or without scales; cicatrices of the flowers variously shaped, sometimes having short hairs at the margins.

Tribes of the *Compositae*:

TUBIFLORAE, plants without milky juice, disc-flowers not ligulate: **Vernonieae, Eupatorieae, Astereae, Inuleae, Heliantheae, Helenieae, Anthemideae, Senecioneae, Calenduleae, Cinareae, Mutisieae.**

LIGULIFLORAE, plants with milky juice, disc-flowers ligulate: **Cichorieae.**

VERNONIEAE DC. Prod. V (1836) 9; HOFFMAN in ENGL.-PRANTL. Nat. Pfl. IV 5 (1894) 120, *Vernoniaceae* BENTH. et HOOK. Gen. Pl. II (1873—1876) 165, 169.

Perennial herbs or shrubs, rarely trees or annuals. *Leaves* alternate, entire or dentate, very rarely lyrately pinnatifid. *Heads* discoid, homogamous. *Involucre* manyseriate, scales imbricate. *Flowers* bisexual, all fertil. *Corolla* regular, tubular, white, violet, red or blue, never yellow, limb 5-fid. *Anthers* sagittate, with terminal appendage, completely filled with pollen at the base, auricles obtuse or acute, usually connate to the end. *Style*-branches two, usually long and slender, attenuate to the top, acute or subacute, outside pubescent. *Achene* terete or slightly flattened, 10-ribbed or 4—5-angled. *Pappus* setaceous, setae in some genera flattened into scales or much reduced or wanting. *Receptacle* naked or slightly fimbrillate.

Key to the subtribes.

Heads not glomerate or shorter than 5 mm, one to numerous flowers in a head . . . . I. **Vernoninae**, p. 369

Heads glomerate longer than 5 mm, one to few flowers in a head. II. **Lychnophorinae**, p. 456

I. VERNONINAE HOFFM. l. c. 121 — *Euvernonieae* BENTH. et HOOK. l. c. 165.

Heads not clustered into heads of second order; heads one- to many-flowered.

Key to the genera.

1\. a. Achene with a pappus 2
b. Achene without a pappus . . . . 2. **Ethulia**, p. 373
2\. a. Pappus consisting of 3 very thick white scales, afterwards connated to a cup-shaped pappus . . . . 1. **Struchium**, p. 370
b. Pappus consisting of setae or scales 3
3\. a. No outer herbaceous scales of the involucre; pappus usually biseriate, occasionally uniseriate, permanent or caducous . . . 4. **Vernonia**, p. 380
b. Outer involucral scales herbaceous; pappus uniseriate, caducous . . 3. **Centratherum**, p. 376

1. STRUCHIUM.

STRUCHIUM P. Browne Jam. (1756) 312. t. 34 fig. 12; P. Browne in St. Hilaire Expos. I (1805) 406; Gleason in Bull. N. Y. Bot. Gard. IV (1905—1907) 155; *Sparganophorus* Vaillant Act. Soc. Par. (1719) 386; Less. in Linnaea IV (1829) 335; Less. Syn. Comp. (1832) 147; DC. Prod. V (1836) 11; Benth. et Hook. Gen. Pl. II (1873—1876) 223; Oliver Fl. trop. Afr. III (1877) 262; Baill. Hist. Pl. VIII (1886) 126; Hoffm. in Engl.-Prantl Nat. Pfl. IV 5 (1894) 123; Boerl. Fl. Ned. Ind. II (1899) 170; Koorders Exc. Fl. Java III (1912) 312; Ridley Fl. Mal. Penins. II (1923) 179.

A monotypic genus in tropical America, introduced into Africa and the Malay Archipelago.

(1) **Struchium Sparganophorum** (L.) O. K. Rev. Gen. Pl. I (1891) 366; Gleason in Bull. N. Y. Bot. Gard. IV (1905—1907) 155; *Ethulia Sparganophora* L. Sp. Pl. ed. II (1763) 1171; Burm. Fl. Ind. (1768) 176; Willd. Sp. Pl. III (1804) 1740; *Sparganophorus Vaillantii* Crantz Inst. I (1766) 261; Gaertn. Fruct. II (1791) 395 t. 165 fig. 4; Pers. Syn. Ench. II (1807) 398; DC. Prod. V (1836) 12; Baker in Fl. Bras. VI 2 (1873—1876) 7; Hoffm. in Engl.-Prantl Nat. Pfl. IV 5 (1894) 123 fig. 72A; Boerl. Fl. Ned. Ind. II (1899) 170, 234; Koorders Exc. Fl. Java III (1912) 312; Merrill Journ. R. As. Soc. (1921) 586; Ridley Fl. Mal. Penins. II (1923) 179; Humbert Comp. Madagascar (1923) 25; Backer Handb. Suikerr. VII (1932) 750; *Sparganophorus Struchium* Pers. Ench. II (1807) 398.

Annual herb, 25—70 cm high. Subsoil stem horizontal, with numerous roots. *Stem* one or more together, erect or somewhat zigzag, branched especially at the lower part or without branches, subterete or irregularly angular, glabrous or slightly pubescent, striate or nearly smooth, glandular, 4—5 mm thick at base, gradually attenuate to the top (to 1 mm);

side-branches 1½—25 cm long, bearing many heads and small leaves. Internodes 1—6 cm long. *Leaves* sessile or very shortly petiolate (petiole 5—13 mm long, 1—3 mm thick), broadly or narrowly elliptic or obovate-elliptic, acuminate (top obtuse or nearly acute), gradually and long narrowed to the base, serrate or repandate and entire at the lower narrowed part (teeth on a distance of 2—6 mm, ½—1 mm long, rather obtuse, directed forward), sometimes entire (especially those of the side-branches), pinninerved (lateral nerves prominent beneath, about 7—12 on each side), glabrous (younger leaves and midrib of the older ones pubescent), glandular on both sides, more or less warty above, chartaceous or membranous; blades 5—16 cm long, 2—6 cm broad, of the upper ones narrowly elliptic to lanceolate, 3—15 cm long, ½—5½ cm broad; leaves of the side-branches subentire, 2½—5 cm long, 1—2 cm broad. *Heads* glomerate in the axils, 1—8 together, sessile, sometimes with one or more, small elliptic leaves at the base (1—1½ cm long, 3—4 mm broad), hemispheric, 40—50-flowered, 3 mm long, 5 mm thick. *Involucre* basin-shaped, 3-seriate; scales about 20, ovate, acutely cuspidate, glabrous, one-nerved, scarious and fringed at the margin, convexly bent, 2 mm broad, 3 mm long; the outer ones ½ mm broad and 1 mm long. *Corolla* campanulate, glabrous, glandular, 2 mm long, tube slender, less than 1 mm long; limb 3-lobed, lobes acute, more than half as long as the limb. *Anthers* 3; basal auricles acute. *Style* shortly forked, thickened and papillous below the bifurcation, 2½ mm long; branches less than ½ mm long, slender, rather obtuse. *Achene* turbinate, irregularly 3—4-angular, convexly bent, glabrous, glandular, 1—1½ mm long, nearly 1 mm thick. *Pappus* consisting of 3 very thick white, ovate or irregularly shaped scales, afterwards connated to one cup-shaped, irregularly and obtusely dentate, cartilagineous pappus. *Receptacle* flat.

Distribution in the Malay Archipelago:

Sumatra: *East Coast*: near Medan: Lörzing 3717 (B), 3126 (B) — Serdang, Lörzing 3429 (B) — Deli, Belawan, Lörzing 3453 (B) — East Coast, Yates 1090 (B); *Tapanoeli*: Sibolangit, near Bintanmariah, Lörzing 5404 (K, L); *Djambi*: Selemboekoe, Posthumus 774 (B); *Lampongs*: Wailima near Telokbetong, Iboet 311 (L) — Negararatoe near Telokbetong, de Vogel 1915 (B) — Telokbetong, coll. unkn. 3 V 1908 (B) — P. Sebesie near Telokbetong, Docters van Leeuwen 5424 (B).

Simaloer: Achmad 496 (L).

Bangka: Soengei Liat, Bünnemeyer 1704 (L) — Bentja, Bünnemeyer 2279 (L) — Bangka, Bünnemeyer 1975 (B).

Riouw Arch: Papan, BÜNNEMEYER 7784 (L, K).

Lingga Arch: Lingga, BÜNNEMEYER 6754 (L) — P. Singkep, BÜNNEMEYER 7302 (L).

Anambas Islands: P. Siantan, VAN STEENIS 1026 (L) — Temaja, HENDERSON 20483 (B, K).

Mentawei Islands: P. Siberoet, IBOET 159 (L).

Java: *West Java*: Menes, BACKER 7080 (B) — Rangkasbitoeng, BACKER 2156 (B) — Buitenzorg, BOERLAGE V 1888 (L), BAKHUIZEN VAN DEN BRINK 654 (L), herb. HASSKARL (L), HALLIER 154a, b, c, d, (B), BAKHUIZEN VAN DEN BRINK 1016 (B), DE VRIES 39 (B), BACKER 32026 (B) — north of Buitenzorg, BACKER 22204 (B) — Buitenzorg, Oud Kedoeng-halang, VAN STEENIS 1583 (B) — Batavia, KOORDERS 32627 (L), BACKER 32032 (B) — Batavia, north, BAKHUIZEN VAN DEN BRINK 2111 (B) — S.W. of Weltevreden, BACKER 32021 (B) — Weltevreden, BACKER 32030 (B), WEEHUIZEN 2 (B) — south of Leuwiliang, BAKHUIZEN VAN DEN BRINK 7160 (B) — Depok, KOORDERS 31323 (B) — Tjitjadas, VAN STEENIS 5374 (B) — Tjiampea, KOORDERS 31449 (B) — N.E. of Poerwakarta, BACKER 13779 (B) — Soekaboemi, BACKER 2156 (B) — Bandoeng, BACKER 5153 (B) — Tjiandjoer, BACKER 13423 (B) — G Gede, BACKER 3019 (B) — Tjilendek, RAAP 331 (L); *Middle Java*: Tirto near Pekalongan, DOCTERS VAN LEEUWEN 30 (B, U) — Tegal, east, BEUMÉE 3726 (B) — Pekalongan, BACKER 15487 (B) — Pemalang, BACKER 23336 (B) — Keboemen, BRINKMAN 45 (B); *East Java*: Djember, BACKER 18298 (L, B) — Poeger, BACKER 18099 (B) — Djatiroto, BACKER 7841 (B).

Borneo: *S. and E. division of Borneo*: Pembliangan, north, AMDJAH 825 (L, K) — *Br. N. Borneo*, Sandakan, RAMOS 1338 (B).

Celebes: Loewoe, Palopo (one specimen in a swamp), KJELLBERG s.n. (B).

Moluccas: *Amboina*: Karang Pandjang, RANT 263 (B) — Amboina, ROBINSON 1843 (L, K).

Flowers white (KJELLBERG), greyish green (LÖRZING), creamy white (BAKHUIZEN VAN DEN BRINK); styles violet (KJELLBERG, LÖRZING), white or pale violet (BACKER).

Vernacular names: *awa lanaroeh, patjar hoetang* (all Java).

Hab.: More or less frequent, usually along edges of ditches and ponds, besides in rice-fields, along waysides, in a teak forest, in swamps along the coast, in ruderal places, in a european garden, in a damp grass field, in a river bed; in not too shady places (ex BACKER l.c.).

Altitude: 0—700 m.

Flowers during the whole year.

Distribution: America (Brazil!, Ecuador!, Guiana!, West Indies!), Africa!,

Madagascar!, Asia (Siam, Malay Peninsula!). Originally from trop. America, introduced into Africa and Asia.

2. ETHULIA.

ETHULIA L. Sp. Pl. ed. II (1763) 1171; LESS. in Linnaea IV (1829) 336; LESS. in Linnaea VI (1831) 682; LESS. Syn. Comp. (1832) 148; ROXB. Fl. Ind. III (1832) 413; DC. Prod. V (1836) 12; MIQ. Fl. Ind. Bat. II (1856) 8; BENTH. et HOOK. Gen. Pl. II (1873—1876) 224; CLARKE Comp. Ind. (1876) ii; OLIVER Fl. trop. Afr. III (1877) 262; HOOK. Fl. Br. Ind. III (1882) 226; BAILL. Hist. Pl. VIII (1886) 120; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 123; BOERL. Fl. Ned. Ind. II (1899) 171; ELMER Leafl. Phil. Bot. I (1906) 87; KOORDERS Exc. Fl. Java III (1912) 313; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 456; LEMÉE Dict. Genr. III (1931) 23.

Herbs. *Leaves* serrate, pinninerved. *Heads* small, loosely corymbose. *Involucre* campanulate; scales manyseriate with serious white edges; exterior ones gradually shorter. *Corolla tubular,* limb campanulate. *Anthers* with obtuse or rounded basal auricles. *Style*-branches glandularly hirsute, subulate at tip. *Achene* angular, 4—5-ribbed, glandular between the prominent ribs, truncate, with a callose ring at the top. *Pappus* wanting. *Receptacle* flat or convex, naked.

About 10 species: 5 in trop. Africa (Congo, Uganda, South-Egypt!, Sansibar! Abyssinia!, Nubia!, Haut-Oubangui!, Comores); 1 in Madagascar and 3 or 4 in trop. Asia (Bengal!, Assam!, Burma!, Indo-Chine!, Formosa, Luzon!, Java!, Bali!, Timor!).

Key to the species.

1. a Heads many flowered, subglobose, about 6 mm long and as wide; achene 5—6-angular with thickened ribs . . . . (1) **E. megacephala.**
   b. Heads 3-flowered, ovoid oblong, 4 mm long; achene 3-angular with prominent ribs . . . . (2) **E. triflora.**

(1) **Ethulia megacephala** SCH.-BIP.! in ZOLL. Syst. Verz. Ind. Arch. (1854) 119 (nomen); MIQ.! Pl. Jungh. (1854) 495 (descriptio); MIQ.! Fl. Ind. Bat. II (1856) 8; CLARKE Comp. Ind. (1876) 1; BOERL. Fl. Ned. Ind. II (1899) 171, 234; KOORDERS! Exc. Fl. Java III (1912) 313; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 456; VAN STEENIS in Bull. Jard. Bot. Buit. Sér. III Vol. XIII (1934) 188; *Pseudalomia orientalis* ZOLL. in Nat. Gen. Arch. Neêrl. Ind. I (1844) 484 (nomen); *Ethulia conyzoides* ZOLL.! in Nat. Gen. Arch. Neêrl. Ind. II (1845) 224 (non L.) — Pl. I, *a*; Pl. II, 1—2.

Herb (acc. to JUNGHUHN nearly a shrub), 35—60 cm high, branched or without branches. *Stem* erect, terete or subterete, ribbed, glandular, appressedly pubescent, subglabrous on the lower part, upper part 3—6 mm thick, lower part about 8 mm thick, lower part leafless. Scars of the leaves obvious. Subsoil stem horizontal, glabrous with sparse roots. *Leaves* subsessile or petiolate (petiole ½—2 cm long, deltoidly widened at the base, 1—1½ mm thick at tip, 2—3½ cm thick at the base) lanceolate-oblong to lanceolate, narrowed at both ends, long acuminate at tip (top acute), dentate (distance of the teeth 2—10 mm, teeth acute, directed forward) or subentire, subcoriaceous, penninerved (lateral nerves 16—28; extreme ones reticulate), shortly pubescent or subglabrous above, rusty pubescent beneath on the nerves only or subglabrous, glandular at both sides, 7½—17 cm long, 1—4 cm broad, superior ones 4—6½ cm long, ½ -1 cm broad. *Inflorescence* terminal, corymbose, dichotomous, dense, consisting of many heads, much branched, 8—18 cm high, 6—16 cm wide, branches long (to 10 cm), densely and shortly rusty felty pubescent ,glandular, with linear pubescent bracts at the base or higher on (bracts about 3—9 mm long). *Heads* many-flowered, pedunculate (peduncles felty pubescent, ½—2 cm long, 1 mm wide) subglobose, 5—7 mm wide and as long *Involucre* imbricate, hemispheric, 3—4-seriate, shorter than the flowers, scales about 30, convexly bent, uni-nerved, shortly pubescent, glandular; interior ones oblong, more or less rounded at the top, irregularly dentate at the upper part, with scarious edges, 6 mm long, 1½ mm broad; exterior ones oblong-elliptic, acute at tip, with ciliate edges, 1½—4 mm long, ½—1½ mm broad. *Corolla* fleshy?, glabrous, glandular, 4½ mm long; limb campanulate, 5-lobed (lobes acute at tip, more than half as long as the limb); tube short, 1½ mm long. *Anthers* obtuse at tip; auricles rather obtuse. *Style* papillous below the bifurcation; branches papillous beneath, 1 mm long, obtuse at tip. *Achene* obpyramidate, 5—6-angular, with thickened ribs, slightly bent, glandular (glands in regular rows between the ribs), truncate at the top, crowned by a round disc and a central small cylinder (surrounding the style at the base and remaining, when the corolla has dropped), achene 2—3 mm long, 1—1½ mm thick. *Pappus* wanting.

Distribution in the Malay Archipelago:

J a v a: *Middle Java*: G. Soembing, JUNGHUHN! V—VI, det. MIQ. (U), 339 (L), DOCTERS VAN LEEUWEN 8730 (B), LÖRZING 30a (B) — G. Oengarang, north slope, JUNGHUHN? V—VI, det. MIQ. (U); *East Java*: G. Lawoe, crater, Sarangan, RANT 1922 (L), id. south-east slope; ELBERT s.n. (L), id., BACKER 6803 (B) — G. Wilis, higher area, Herb. JUNGHUHN

375 det. MIQ. (L.U), id., coll. unknown 931-1-632 (B) — G. Ardjoeno, north slope, Lalidjiwo, RANT (L), KOORDERS 43865 (L), G. Ardjoeno, ARENS s.n. (B), BREMEKAMP s.n. (B), KOORDERS 43729 (B), 43723 (B) — G. Kawi, KOOPAL s.n. (B) — Idjen, RANT s.n. (B), Herb. REINWARDT, 1591 det. MIQ. (L), ZOLLINGER 2830 (BR. M.), id. Kawah-Idjen, BACKER 25303 (B), id. Gending waloe, KOORDERS 43359 (B) — G. Walirang, ZOLLINGER 3173 (L, Br. M.) — Idjen, G. Ongop Ongop, VAN DER PIJL 140a (B); Java, WURTH s.n. (B); Java, mountains, WAITZ s.n. (L).

Bali: coll. unknown, H. L. B. 900-282-26 (L).

Corolla violet (ZOLLINGER, KOORDERS), pale violet (DOCTERS VAN LEEUWEN). Flowers badly smelling (BACKER). Herb 1½ m high (KOORDERS, DOCTERS VAN LEEUWEN).

DE CANDOLLE describes a very small coroniform fleshy entire pappus in this genus and is followed as to this by MIQUEL (l.c. 8). The species dealt with has no pappus. The small cylindric disc, surrounding the style at the base, cannot be considered as a pappus, being inside the corolla.

Vernacular names: *tjoengoelan* (Jav.), *katoetoengkoel* (Sund.).

Hab.: rare, as a rule, usually some specimens together, in Casuarina forests, in grassy fields and on slopes, in open places in the forests as well as in shady places.

Altitude: 1400—3000 m, descending to 330 m, acc. to JUNGHUHN.

Flowers: Febr., April—Nov.

MIQUEL, HOOKER and BOERLAGE record *Ethulia conyzoides* L. from Java, (with a ?, however) and MIQUEL and HOOKER from the Sunda Archipelago. However, not a single specimen of *Ethulia conyzoides* L. from the Dutch East Indies has thus far been found in the herbaria consulted. This species differs from *Ethulia megacephala* SCH.-BIP. in the long side-branches (up to 30 cm long), the oblong-elliptic leaves, the compound corymbose inflorescences, the small heads (3 mm long and as wide) on slender penduncles (1½ mm wide), the 3-seriate involucre, the achenes with prominent ribs, 1½—2 mm long, 1 mm wide and the corolla, which is 1½ mm long and 1 mm wide, with lobes not much longer than half the limb.

Distribution: Asia (Bengal!, Assam!, Burma, Tongking, Laos, Cochinchina, Formosa), Australia, Africa!, Madagascar.

The Philippine specimens in the Leiden Herbarium, identified as *Ethulia conyzoides* L. (Luzon, MERRILL 11703, ELMER 8360, RAMOS B. Sci. 5432, For. Bur. 16124) are herbs of the habit of *E. megacephala*, branched at the upper part or without side-branches, 36—115 cm high, with elliptic leaves on rather long petioles (1—1.2 cm long); the upper part of the stem is densely felty pubescent; the inflorescences are small, corymbose, consisting of few heads; the heads are 4—5 mm long and as wide, the corolla is 3 mm long and 1 mm wide with lobes, which are nearly as long as the limb; the achenes are 1½ mm long and 1 mm wide, with ribs like those of *E. megacephala;* involucre 3-seriate. These Philippine specimens seem to be different from those in Java and Bali.

(2) **Ethulia triflora** nov. spec.; *Ethulia* n. sp. VAN STEENIS in Bull. Jard. Bot. Buit. Sér. III Vol. XIII (1934) 188; Pl. I, *a*; II, 3—5.

Herba, plusquam 30 cm alta. Rami teretes, multo-striati, glanduloso-puberuli, 2—3½ mm crassi, internodiis 1½—3 cm longis. *Folia* alterna, petiolata (petiolo ½—1 cm longo, glanduloso-puberulo), oblongo-elliptica, apice longe acuminata, acuta, ad basin longe attenuata in petiolum, serrata (partibus superiori et inferiori integris), pinninervia (nervis plus minusve 20, breviter distantibus), membranacea, utrinque breviter puberula, subtus nigro-punctata; laminae 5½—6 cm longae, 1½—2 cm latae, superiores sensim minores. *Capitula* parva, compacte corymbosa, triflora, ovato-oblonga, 4 mm longa, 1½ mm crassa, brevissime pedunculata. *Involucrum* biseriatum; squami interiores 3, elliptici, margine scariosi, apice acuti, 3-nervati, glandulosi, parce puberuli; exterior 1, minor. *Flores* bisexuales. *Corolla* infundibuliformis, glandulosa, 3½ mm longa; tubus brevis, tenuis, 1 mm longus; limbus 5-lobatus, lobis lanceolatis, apice acutis, tubo longioribus. *Antherae* ad basin sagittatae, apice acutae, auriculis rotundatis. *Stylus* bifurcatus; rami breves, externe glanduloso-hirtelli, apice acuti. *Achenium* incrassatum, subobpyramidatum, apice truncatum et annulo crasso, calloso, irregulariter triquetrum, glandulosum praeditum, costis prominentibus, 1½ mm longum, 1 mm crassum. *Receptaculum* parvum, planum, nudum.

Distribution in the Malay Archipelago.

South Central Timor, Moetis, Nenas — WALSH 310 (B), type specimen.

Vernacular names: *hoen honi* (Timor).

Hab.: in grassy fields in the mountains, numerous (WALSH).

Altitude: 1250 m.

Flowers: May.

3. CENTRATHERUM.

CENTRATHERUM CASS. in Bull. Soc. phil. (1817) 31; LESS. in Linnaea IV (1829) 19; DC. Prod. V (1836) 70; BENTH. Fl. Austr. III (1866) 460; BENTH. et HOOK. Gen. Pl. II (1873—1876) 225; CLARKE Comp. Ind. (1876) ii, 1; HOOK. Fl. Br. Ind. III (1882) 227; BAILL. Hist. Pl. VIII (1886) 121; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 123; BOERL. Fl. Ned. Ind. II (1899) 171; GLEASON in Bull. N. Y. Bot. Gard. IV (1905—1907) 156; ELMER Leafl. Phil. Bot. I (1906) 87; KOORDERS Exc. Fl. Java III (1912) 313; LEMÉE Dict. Genr. II (1930) 17; *Phyllocephalum* BL. Bijdr. (1825) 888; *Amphirephis* H. B. K. Nov. Gen. IV (1820) 32; LESS. Syn. Comp. (1832) 148.

Herbs. *Leaves* petiolate, serrate. *Heads* pedunculate, solitary or corymbose, many-flowered. *Involucre* campanulate or hemispheric, many-seriate; outer scales herbaceous, often leafy; inner ones scarious or membranous. *Corolla* tubular, narrowly 5-fid. *Anthers* appendiculate at tip; basal auricles obtuse. *Style*-branches long, pubescent, subulate at tip. *Achene* oblong, 8—10-ribbed, glabrous, glandular. *Pappus* 1-seriate, short, setaceous, caducous. *Receptacle* nearly flat, naked, sometimes alveolate.

About 18 species: 4 species in trop. America (Mexico, Paraguay!, Venezuela, Brazil!, Guyana!, Columbia!, West Indies!), of these 1 also in Australia!; 1 in New Zealand; 11 in trop. Asia (Madras!, Bengal!, Burma!, Mal. Penins.!, Luzon!, Java!); 2 in trop. Africa (Congo), 1 of these also in Madagascar!

(1) **Centratherum frutescens** (Bl.) Benth. et Hook. Gen. Pl. II (1873—1876) 225; van Steenis in Bull. Jard. Bot. Buit. Sér. III Vol. XIII (1934) 186.

Shrub, rigid. *Stem* terete, narrowly ribbed, more or less densely rusty or fulvously villous or shortly greyish pubescent, upper part 2—3 mm thick, lower part 4—6 mm thick; internodes 3—9 cm long; side-branches 4—28 cm long, densely leaved. *Leaves* petiolate or subsessile (petioles villous, ½—2 cm long, 1—2 cm thick), elliptic or oblong-elliptic, acuminate at tip, shortly narrowed to the base, acute at both ends, shortly mucronately dentate or subcrenate, densely whitish woolly tomentose, greyish shortly pubescent or subglabrous beneath, dark coloured, glandular, strigose (hairs arising from tubercles), rugose above, pinninerved (lateral nerves about 10 pairs; reticulation prominent), blades of the upper leaves 2½—6½ cm long, 1—2½ cm broad, of the lower ones 6—14½ cm long, 2—4½ cm broad, of the side-branches mostly much smaller (1½—8 cm long, 1—3 cm broad) *Heads* solitary, terminal and in the axils of the two upper leaves, subsessile or pedunculate (peduncles 1—7 cm long, 1½ mm thick, tomentose like the branches) with 1—4 foliaceous bracts at the base (bracts ovate at the base, acuminate at the top, glandular, rusty tomentose beneath, 1—3 cm long, ½—1 cm broad), hemispheric or subglobose, many-flowered, 8—15 mm long, 11—25 mm wide. *Involucre* hemispheric, imbricate, 4-seriate; the two inner rows consisting of oblong, scarious, glabrous, 3—5-nerved scales, 7—11 mm long, 1½—2 mm broad, sharply acuminate, entire or irregularly dentate at tip; scales of the outer rows variable. *Corolla* infundibuliform, 5-lobed (lobes much more than half as long as

the limb, narrow, recurved, acute, densely glandular at tip), glandular; limb 4 mm long, tube 5 mm long, with long white hairs outside. *Style* 7 mm long, rather thick, with short hairy branches; branches 1½ mm long, subacute, grooved inside. *Anthers* shortly sagittate (tails subobtuse), subacute at tip; filaments inserted somewhat below the lobes. *Achene* oblong, glabrous, with 10 prominent light coloured ribs and brownish grooves between; top flat, subpubescent; achene 1 mm thick, 3 mm long. *Pappus* consisting of about 20 nearly similar, slightly bent, dingy whitish. ciliate setae, 2 mm long. *Receptacle* alveolate.

Distribution: Java.

1. var. **typicum**; *Phyllocephalum frutescens* BL.! Bijdr. (1825) 889; *Decaneurum frutescens* DC. Prod. V (1836) 66; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 222; MIQ.! Pl. Jungh. (1854) 496; MIQ.! Fl. Ind. Bat. II (1856) 20; *Gymnanthemum frutescens* SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 120; *Centratherum frutescens* BENTH. et HOOK. Gen. Pl. II (1873—1876) 225; CLARKE Comp. Ind. (1876) 5; BOERL. Fl. Ned. Ind. II (1899) 172, 234; KOORDERS Exc. Fl. Java III (1912) 313.

Stem more or less densely rusty or fulvously villous (hairs crispy, many-celled, articulate, purplish-brownish striate, mixed with one-celled erect shorter hairs). *Leaves* densely whitish woolly tomentose beneath (nerves villous like the stem). *Heads* hemispheric, 1—1½ cm high, 1½—2½ cm wide. *Involucral scales* of the third row ovate, scarious, glabrous, 5-nerved, 11 mm long, 2 mm broad, with a foliaceous, shortly pubescent, long and narrow tip; of the outermost row consisting of a broadly ovate or nearly round upper part (sparsely rusty villous) and a shorter more narrow lower part, sharply aciminate to filiform at the top (tip 2 mm long), foliaceous, glandular with ciliate edges, 5-nerved (ultimate nerves reticulate), 8—12 mm long, 3—6 mm broad, as long as or longer than the inner rows.

Distribution in the Malay Archipelago:

Java: *West Java*: Tjimahi, KORTHALS s.n. (L) — near Telegapatengan, S.W. of Bandoeng, JUNGHUHN 382 (L), det. MIQ. sub nomine *Decaneurum frutescens* DC. — G. Papandajan, VAN STEENIS 4398 (L), 4368 (L, K), 4874 (B) — G. Patoeha, west, VAN STEENIS 4427 (L) — Java, BLUME H. L. B. 900, 194—167, —168, —171, —172, —174 (L), sub nomine *Phyllocephalum frutescens*, BLUME s.n. (Br. M.), JUNGHUHN s.n. (L), FORBES 950 (L).

Flowers purple (BOERLAGE), whitish (JUNGHUHN). Shrub partly climbing, partly hanging (VAN STEENIS), to 2 m high (id.); hairs bright purple (id.).

Hab.: in swampy places (Blume).
Altitude: 1700 m, 2040 m.
Flowers: March, June.

2. var. **javanicum** (Miq.) nov. comb.; *Decaneurum javanicum* Miq.! Pl. Jungh. (1854) 496; Miq.! Fl. Ind. Bat. II (1856) 20; *Centratherum javanicum* (Miq.) Boerl. Fl. Ned. Ind. II (1899) 172, 234; Koorders Exc. Fl. Java III (1912) 313; Moore in Journ. Bot. LXIII (1925) suppl. 54; Hochreutiner in Candollea V (1931—1934) 296.

Stem shortly greyish pubescent (most of the hairs one-celled, not articulated; only few hairs articulate and crispy). *Leaves* subglabrous (except on the nerves) or greyish shortly pubescent, glandular beneath; younger ones whitish woolly tomentose beneath. *Heads* subglobose, 8—15 mm long, 11—17 mm wide. *Scales of the involucre* gradually shorter to the exterior ones, glandular, all 3-nerved; of the third row mucronate at tip, 3—4 mm long; of the outer row ovate, foliaceous, mucronate, pubescent, 5—7 mm long, 2—3 mm broad, shorter than the inner rows.

Distribution in the Malay Archipelago:

Java: *West Java*: G. Malabar, Denker 108 (L), Junghuhn 352 (L), s.n. (U), det. Miquel, summit, van Slooten 303 (L) — Tirtasari near Bandoeng, Smith and Rant 179 (L); *East Java*: G. Wilis, in the highest forests, Herb. Waitz s.n. (L); *Middle Java*: Dieng, Herb. Kuntze 5512 (K); Java, S.E., Forbes 950 (Br. M.), 973b (Br. M.), 964 (Br. M.), Horsfield 9 (K).

2 m. high (Hochreutiner), heads white, violet to the margin (id.).

Boerlage (l.c. 172) already remarked, that this variety should perhaps better be considered as a form of *Centratherum frutescens*.

Altitude: 1500—2300 m.
Flowers: April, June, July, Dec.

3. var. **papandaianense** nov. var.

Caulis pubescens. *Folia* subglabra vel pubescentia, subtus glandulosa. *Capitula* hemispherica. *Involucri* squamae serierum duorum interiorum subaequilongae, interdum purpurascentes, oblongo-lanceolatae; squamae exteriores parce breviores, anguste ovatae, apice longissime et acutissime acuminatae, parte superiori pubescenti.

Distribution in the Malay Archipelago:

Java: *West Java*: G. Papandajan, Went s.n. (L), type specimen, Teysmann s.n. (B), Boerlage s.n. (L) — G. Papandajan, near Tjileuleu, Kleinhoonte 1 (B) — Java, Junghuhn s.n. (L).

This variety seems to be found only on the G. Papandajan.

Centratherum frutescens is much allied to *C. reticulatum* (DC.) Benth., of which the leaves are obtuse at tip, more or less ovate, conspicuously reticulate nerved, all nerves prominent beneath.

4. VERNONIA.

VERNONIA SCHREB. Gen. Pl. II (1791) 541; BL. Bijdr. (1825) 893; LESS. in Linnaea IV (1829) 244; LESS. Syn. Comp. (1832) 146; DC. Prod. (1836) 15; MIQ. Fl. Ind. Bat. II (1856) 9; BENTH. Fl. Austr. III (1866) 459; BENTH. et HOOK. Gen. Pl. II (1873—1876) 226; CLARKE Comp. Ind. (1876) ii, 2; OLIVER Fl. trop. Afr. III (1877) 266; HOOK. Fl. Br. Ind. III (1882) 229; BAILL. Hist. Pl. VIII (1886) 126; HOFFM. in ENGL.-PRANTL IV 5 (1894) 124; TRIMEN Fl. Ceylon III (1895) 5; BOERL. Fl. Ned. Ind. II (1899) 172; KOORDERS et VALETON in Meded. L. Pl. XXXIII (1900) 50; GLEASON in Bull. N. Y. Bot. Gard. IV (1905—1907) 164; ELMER Leafl. Phil. Bot. I (1906) 88; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV (1910) 25; KOORDERS Exc. Fl. Java III (1912) 313; RIDLEY Fl. Mal. Penins. II (1923) 186; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 462.

Herbs, shrubs or trees, sometimes climbers. *Leaves* mostly petiolate. entire or dentate, pinninerved, often glandular, very rarely opposite. *Heads* one- to many-flowered, very variable in size, paniculate or rarely solitary. *Involucre* campanulate or oblong; scales loosely or appressedly imbricate, few- or manyseriate, gradually shorter to the exterior ones. *Corolla* tubular. *Anthers* with acute or obtuse basal auricles. *Style*-branches slender, pubescent, subacute at tip. *Achene* cylindric or turbinate, terete, ribbed or angular, with a callose foot. *Pappus* usually biseriate, rarely uniseriate; interior row consisting of setae, exterior row much shorter, setaceous or paleaceous; setae ciliate. *Receptacle* flat, naked, rarely with short hairs, often alveolate or foveolate.

About 650 species in trop. and temperate America, Africa, Madagascar and Asia.

Key to the sections.

1. a. Pappus 1-seriate (if 2-seriate, inner involucral scales caducous afterwards); heads 1—10-flowered 2
   b. Pappus 2-seriate 4
2. a. Achene angular 3
   b. Achene 10-ribbed . . . . . **VI Decaneurum**, p. 446
3. a. Heads many-flowered; involucral scales linear lanceolate to oblong, acute to very pointed at tip . . . . . **IV Cyanopis**, p. 429
   b. Heads few (1—10)-flowered; involucral scales oblong or ovate, small, obtuse at tip . . . . . **I Strobocalyx**, p. 381
4. a. Achene angular, glabrous or pilose; outer row of the pappus consisting of flattened setae or scales 5
   b. Achene subterete or terete, more or less clearly ribbed; more or less

appressed pubescent; setae of the outer row of the pappus filiform **III. Tephrodes**, p. 406

5. a. Heads paniculate or corymbose, or few together, pedunculate; 12- to many-flowered 6

b. Heads glomerate, sessile or subsessile, 2—9-flowered **VII. Congestae**, p. 451

6. a. Outer row of the pappus consisting of flattened setae . . . . . . **V. Claotrachelus**, p. 437

b. Outer row of the pappus consisting of scales . . **II. Lepidella**, p. 403

I. Sectio **Strobocalyx** BL. in DC. Prod. V (1836) 21 (incl. *Monosis* sect. *Eumonosis* DC. l. c. 21) ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 217; MIQ. Fl. Ind. Bat. II (1856) 9; BENTH. et HOOK. Gen. Pl. II (1873—1876) 230; OLIVER Fl. trop. Afr. III (1877) 269; HOFFM. in ENGL.-PRANTL IV 5 (1894) 125; MATTF. in Engl. Bot. Jahrb. LXII (1929) 397.

Trees or shrubs. *Leaves* petiolate, oblong, ovate, obovate or lanceolate, entire, sometimes dentate, pinninerved, acuminate at tip, rotundate at the base or attenuate into the petiole, subcoriaceous, glabrous or pubescent, glandular beneath. *Heads* numerous, broadly corymbose-paniculate, usually small, oblong, shortly pedunculate or sessile, few-flowered (flowers 1—10; an African species many-flowered according to OLIVER l. c.). *Involucre* campanulate, ovoid; scales oblong or ovate (lanceolate in an African species according to OLIVER l. c.), small, obtuse at tip; inner ones caducous afterwards. *Anthers* usually long-tailed; tails mostly acute, sometimes obtuse. *Achene* oblong-turbinate, irregularly angular, glabrous or subpubescent, glandular. *Pappus* uni- or biseriate; setae strawy, coarse, dingy whitish; of the outer row, if present, much shorter, scarce.

Trop. Asia and Africa.

Key to the species.

1. a. Heads more than one-flowered. Pappus uniseriate or nearly biseriate 2

b. Heads one-flowered. Pappus biseriate . . . . (5) **V. kabaënsis.**

2. a. Heads ten-flowered 3

b. Heads 3—7-flowered 4

3. a. Heads 11 mm long; inner involucral scales oblong, rounded at tip; corolla 9 mm long . . . . (2) **V. patentissima.**

b. Heads 8 mm long; inner involucral scales elliptic, obtuse at tip; corolla 5½—6½ mm long . . . . (6) **V. fimbrillata.**

4. a. Heads 5—7-flowered 5

b. Heads 2—3-flowered . . . . (3) **V. amboinensis.**

5. a. Leaves obovate-elliptic, numerous, small; blades 3½—6 cm long, 2—2½ cm broad; petioles short, ½—1 cm long. Heads 6—7-flowered; involucre 5—6-seriate . . (7) **V. phanerophlebia var. dulitensis.**

b. Leaves broadly elliptic, tips broad; blades 6—9 cm long, 4—6½ cm broad; petioles 1—2½ cm long. Heads 5-flowered; involucre regularly 6—7-seriate, loosely imbricate . . . . (4) **V. durifolia.**

c. Leaves obovate-elliptic, oblong-elliptic or broadly elliptic (tips narrow); blades 10—20 cm long, 3—2 cm broad; petioles 1—3½ cm long. Heads 5—6-flowered; involucre 5—6-seriate . . . (1) **V. arborea.**

(1) **Vernonia arborea** HAM. in Trans. Linn. Soc. XIV (1825) 218.

Tree up to 36 m. *Stem* erect, flowering branches subterete, striate, glabrous (except the younger villous parts, glandular, 4—8 mm thick; internodes 1—3½ cm long; cicatrices of the petioles subdeltoid. *Leaves* petiolate (petioles very straight, widened at the base, glabrous or villous, 1—3½ cm long, 1—2 mm thick), elliptic or ovate, suddenly acuminate at tip, more or less attenuated, rounded or subacute, sometimes inaequilateral at the base, entire, pinnivervd (nerves prominent beneath, glabrous at both sides or fulvously shortly villous beneath, lateral ones 8—14 pairs, arcuately connected at tip, extreme ones reticulate), subcoriaceous or coriaceous, glabrous, glandularly spotted, more or less shining above, glabrous, pubescent, villous or tomentose, glandular beneath; blades 10—20 cm long, 3—8 cm broad; superior ones gradually smaller. *Inflorescence* large, terminal and in the axils of the upper leaves, more or less corymbosely pyramidly copiously paniculate, to 24 cm broad, to 28 cm high, branches spreading, nearly rectangular on the principal axis (smaller branches repeating this ramification), more or less crispy fulvously woolly tomentose; the lowest branches having a small leaf or a bract at the base. *Heads* shortly pedunculate (peduncles crispy fulvously woolly tomentose, 1—4 mm long, ½ mm thick), oblong 5—6-flowered, 8—9 mm high, 3½ mm wide. *Involucre* 5—6-seriate, oblong campanulate; scales attenuate, subacute or obtuse at the top, glossy inside, glabrous, pubescent, villous or tomentose, glandular at tip, ciliate at the edges, spreading, when the achene has ripened; interior scales ovate-oblong, 2—3 mm long, about 1 mm broad; the next ones ovate-oblong; the extreme ones ovate, minute, villous. *Corolla* tubular-infundibuliform, covered with spreading hairs, very variable in length, 5—7 mm long, nearly 1 mm wide; limb gradually narrowed into the tube; lobes 5, lanceolate, acute at the top, about 1½ mm long. *Style*-branches long, slender, acute at tip, pubescent. *Anthers* sagittate, tailed at the base, acuminate, acute at tip. *Achene* subtriangular, turbinate-oblong, flattened at two sides, semi-terete at the third side, irregularly ribbed (ribs about 8), glandular, glabrous or pubescent, 2—3 mm long, nearly 1 mm thick with a basal callose ring. *Pappus* subbiseriate, setaceous; setae flat, obscurely ciliate, dingy whitish, of the inner row

numerous, 5—7 mm long, of the outer row few or hardly any, less than 1 mm long. *Receptacle* small, glabrous; cicatrices of the achenes subangular with a small thornlike projection, fitting to the basal ring of the achene.

Distribution: British India, Indo-China, Mal. Penins., S. China, Philippines, Malay Archipelago.

Key to the varieties:

1. a. Leaves and involucral scales glabrous or nearly so 2
b. Leaves and involucral scales variously pubescent (involucral scales sometimes glabrous), rarely leaves glabrous and involucral scales villous 4

2. a. Pappus biseriate; leaves attenuate at the base 9. var. **celebica.**
b. Pappus uniseriate or nearly so; leaves attenuate or rounded at the base 3

3. a. Corolla small, 3½—4 mm long, lobes spreading afterwards; achene densely minutely glandular . . . . 10. var. **sumatrensis**
b. Corolla infundibuliform-tubular, 5—7 mm long; achene glandular or without glands . . . . 1. var. **typica.**

4. a. Leaves crispy fulvously greyish or rusty woolly tomentose beneath 5
b. Leaves differently pubescent beneath 8

5. a. Leaves conspicuously glandularly spotted on both sides, shortly and broadly acuminate at the top. Inflorescence corymbose . . . . 8. var. **papanensis.**
b. Leaves not clearly glandularly spotted, inflorescence corymbosely paniculate 6

6. a. Involucral scales glabrous . . . . 4. var. **incana.**
b. Involucral scales villous or tomentose 7

7. a. Leaves elliptic, shortly tapering at the base, long acuminate at the top; hairs on the main nerves mixed with long flexible ones . . 3. var. **conferta.**
b. Leaves ovate, elliptic-ovate or oblong-elliptic, more or less attenuate, rounded or subacute at the base, suddenly acuminate at tip; without long hairs mixed with the crispy ones of the main nerves . . . 2. var. **javanica.**

8. a. Branches and leaves beneath covered with long hairs (3—5 mm long); leaves shortly petiolate or subsessile (petioles 1½—1 cm long); obovate-oblong or elliptic-oblong . . . . 13. var. **pilifera.**
b. Without extremely long hairs on branches and leaves; leaves variously shaped; petioles 1—3½ cm long 9

9. a. Involucral scales glabrous or nearly so 10
b. Involucral scales villous 12

10. a. Hairs of the leaves short, nearly straight, not swollen at the base . 7. var. **simalurensis.**
b. Hairs of the leaves short, curved, often swollen at the base . . 11

11. a. Inflorescence corymbose . . . . 11. var. **kenepaiensis.**
b. Inflorescence paniculate . . . . 12. var. **grandifolia.**
12. a. Leaves densely velvety villous, petioles 1—3½ cm long. Involucral scales villous. Achene glandular . . . . . 5. var. **mollissima.**
b. Leaves shortly thinly pubescent beneath, petioles very long (1½—5 cm long). Involucral scales densely villous. Achene clearly glandular, glands often prominent . . . . 6. var. **obovata.**

1. var. **typica**; *Vernonia arborea* HAM. in Trans Linn. Soc. XIV (1825) 218; DC. Prod. V (1836) 22; CLARKE Comp. Ind. (1876) 23; KURZ in Journ. As. Soc. Beng. XLVI 2 (1877) 202; HOOK. Fl. Br. Ind. III (1882) 239; BOERL. Fl. Ned. Ind. II (1899) 234; KOORDERS et VALETON in Meded. L. Pl. XXXIII (1900) 53; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV 2 (1905) 26, ELMER Leafl. Phil. Bot. I (1906) 90; LAUTERBACH in Nova Guinea VIII 4 (1912) 863; KOORDERS Exc. Fl. Java III (1912) 314; GIBBS in Journ. Linn. Soc. XLII (1914) 97; MERRILL in Journ. R. As. Soc. (1921) 586; MERRILL Enum. Phil. III (1923) 592; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 466; MERRILL Univ. Calif. Publ. Bot. XV (1929) 300 — MATTF. in Engl. Bot. Jahrb. LXII (1929) 398; *Conzya arborea* WALL. 3074 comp. 184; *Conzya acuminata* WALL.! Cat (1828) 3034 comp. 144; *Vernonia Blumeana* DC. Prod. V (1836) 22; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 218; MIQ. Fl. Ned. Ind. Bat. II (1856) 10; *Vernonia acuminata* DC. Prod. V (1836) 32 (non LESS.); *Vernonia arborea* HAM. var *glabra* KOORDERS! et VALETON! in Meded. L Pl. XXXIII (1900) 54; *Vernonia arborea* HAM. var. *Blumeana* KOORDERS! et VALETON! l. c. 54; *Vernonia Wallichii* RIDLEY! Fl. Mal. Penins. II (1923) 186 - - Pl. II, 6.

Branches and petioles of the type specimen shortly rusty pubescent. *Leaves* narrowly oblong-elliptic or broadly elliptic (oblong of the type specimen), tip ½—2 cm long (of the type specimen 1½ cm long), narrow, obtuse (acute of the type specimen) sometimes curved, blades rounded at the base, glabrous (of the highest leaves sometimes scarcely crispy fulvously villous), dull beneath, 27 cm long, 9½ cm broad of the type specimen. *Involucre* 5-seriate (of the type specimen); scales glabrous (of the type specimen) or nearly so and slightly pubescent at the top, hardly ciliate at the edges (of the type specimen). *Achene* glabrous (of the type specimen) or scarcely pubescent, glandular or without glands (of the type specimen). *Pappus* uniseriate (of the type specimen).

The type specimen is preserved in the herbarium of the Royal Botanic Garden Edinburgh. On the label is written most probably by the handwriting of HAMILTON: „Vernonia arborea. Gualpara, 19th Sept. 1806". Thereto has been added: „Herb. Francis (Buchanan). Original

n. 1849. Hamilton M. D.; F. R. S.". The specimen has been studied by C. B. CLARKE, as has been written on the sheet.

Distribution in the Malay Archipelago:

S u m a t r a: *East Coast*: Semeloengan, Marehat Hoeta, BOSCHPR. 4878 (L, B) -- near Kisaran (young tree with small leaves), KRUKOFF 318 (B) — East Coast, YATES 978 (B); *Tapanoeli*: Central Habinsaran, near Sibosar, LÖRZING 8017 (L); *West Coast*: G. Singalang, BECCARI 341 (L) — Moearo laboeh, Timboeloen, BOSCHPR. 6006 (B) — Sumatra, FORBES 2900 (L, Br. M.).

J a v a: *West Java*: Poeloesari (Bantam), KOORDERS 2802 (L) — Karang, BLUME s.n. (L); *Middle-Java*: Noesa Kembangan, KOORDERS 26869 (L), 15660 (L, K, B), 39280 (L, K, B, U), 26868 (L), 24551 (L), 20035 (L), 20113 (B), 2782 (B), 30328 (B), coll. unkn. s.n. (L).

C e l e b e s: Todjamboe, KJELLBERG 1704 (L), 2958 (L) — Rante Lemo, KJELLBERG 1603a, very young, (L) -- Minahassa, KOORDERS 16507 (L), 19218 (L), 16508 (B).

B o r n e o: Br. N. Borneo: G. Kinabaloe, falls near Loema, CLEMENS 29951 (L, B, K) — id., margin of Kinitaki river, CLEMENS 32980 (B) -- Tenompok, CLEMENS 29263 (L, B, K), 28431 (L, B, K), 28875 (B) — Kamboeranga, CLEMENS 28993 (L, B, K) -- G. Noenkok, CLEMENS 32682 (L, B) - Marai Parai, CLEMENS 32512 (L, B) — Colombon river, CLEMENS 34175 (L), 34173 (B), 40043 (B) Peniboekan, CLEMENS 30955 (L, B), 30758 (L, B), 31495 (L, B).

Flowers white (KOORDERS), violet (KJELLBERG); pink, whitish grey, lavender blue, white, faintly purplish striped (CLEMENS); style white (KJELLBERG); tree 6—25 m high (CLEMENS), 15—40 cm thick (KOORDERS); 3—5 m high (KJELLBERG).

Vernacular names: *sarimarnauk*, *simargaloengoeng*, *madang sitapoeng* (all Sumatra), *dedek (jorit)*, *merangan* (all Noesa Kembangan).

Hab.: in forests, on jungle rocks.

Altitude: 700—2100 m.

Flowers: Jan.—April, June, Sept., Oct., Dec.

Distribution: Trop. Asia: Ceylon, Nepal, Bengal, Assam!, Burma!, Tongking!, Laos, Annam, Mal. Penins.!, Penang, China, Philippines (Luzon!, Mindanao!, Basilan!), New Guinea.

The length of the corolla is very variable, but the shape is fairly constant. Though the involucral scales of *Vernonia arborea* Ham. var. *glabra* K. et V. are fairly narrow (slightly more than ½ mm wide), this variety can hardly be separated from *Vernonia arborea* var. *typica*, as KOORDERS and VALETON suppose.

The specimens from Celebes quite agree with some of the Philippine specimens (Luzon, ELMER 17085 — Mindanao, ELMER 11289) having some trifling differences with the other specimens of this variety, such as the very long tips of the leaves, the long pappus and the elongate inflorescence.

The Sumatran specimens have large involucral scales (inner ones to 3½ mm

long; the leaves of the sterile branches are minutely and distantly dentate.

In Borneo specimens with obovate-elliptic leaves have been collected (CLEMENS 28993, 29263).

2. var. **javanica** DC. CLARKE Comp. Ind. (1876) 23; KOORDERS et VALETON in Meded. L. Pl. XXXIII (1900) 54; KOORDERS in Nat. Tijdschr. Ned. Ind. LX (1901) 253; *Eupatorium javanicum* BL.! Bijdr. (1825) 903; *Vernonia javanica* DC. Prod. V (1836) 22; ZOLL.! in Nat. Gen. Arch. Neêrl. Ind. II (1845) 217; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ.! Pl. Jungh. (1854) 495; MIQ. Fl. Ind. Bat. II (1856) 10; MIQ. Sumatra (1862) 210; *Vernonia arborea* KURZ in Journ. As. Soc. Beng. XLVI 2 (1877) 202 p.p., HOOK. Fl. Br. Ind. III (1882) 239 p.p.; TRIMEN Fl. Ceylon III (1895) 11; BOERL. Fl. Ned. Ind. II (1899) 234 p.p.; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV (1905) 26 p.p.; KOORDERS Exc. Fl. III (1912) 213 p.p.; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 466 p.p.; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1430 — Pl. II, 7.

Flowering *branches* shortly, densely, glandularly, fulvously or rusty velvety villous (almost bullate); sterile branches subglabrous. *Leaves* of the flowering branches broadly ovate or elliptic-ovate or oblong-elliptic, sometimes subcordate at base, more or less densely, crispy, fulvously, greyish or rusty woolly tomentose beneath; younger leaves tomentose above also; blades 6—7 cm long, 2½—11 cm broad; 6—17 pairs of lateral nerves. Leaves of the sterile branches entire or sharply and minutely dentate (teeth short, very pointed, deltoid), almost glabrous or glabrous, chartaceous or subcoriaceous. *Involucre* 4—5-seriate; scales ovate-elliptic, obtuse or acute at tip, more or less densely fulvously villous. *Corolla* 4½—6 mm long; lobes long (2 mm long). *Achene* sparsely pubescent or glabrous, minutely glandular.

Distribution in the Malay Archipelago:

S u m a t r a: *Atjeh*: Takongan, BOSCHPR. 7621 (B); *East Coast*: Karo-plateau, Wampoe-valley, GALOENGI 441 (B); id. near Brastagi, Sibolangit, LÖRZING 5927 (L, U) — Brastagi, RIDLEY s.n. (K) — Karo-districts, BOSCHPR. 10455 (B) — Lab. Batoe, BOSCHPR. 10347 (B); *Tapanoeli*: Toba-plateau, Pargompoelan, BOSCHPR. 2 (B) — Silindoeng, BOSCHPR. 5258 (B) — Siborong siborong, BOSCHPR. 3834 (L, B); *West Coast*: Fort van de Capellen, BOSCHPR. 6091 (B), 5825 (B) — G. Merapi, BÜNNEMEYER 4637 (B) — Pajacombo, Moenggoeng, BOSCHPR. 7 (B), 5168 (B) — Priaman, DIEPENHORST s.n. (U, K) — G. Koerintji, BÜNNEMEYER 8696 (L, U, B), 8971 (B), id. ROBINSON and KLOSS 7300 (K); id. S. Kembang, ROBINSON and KLOSS s.n. (Br. M.) — lake of

Koerintji, BÜNNEMEYER 8312 (B) — Padang Pandjang, BOSCHPR. 5503 (B) — Painan, BOSCHPR. S. W. K. I. 8 (B, U) — Soepaijong, TEYSMANN s.n. (U, B), 1048 (U) — G. Sago, BÜNNEMEYER 4332 (L); *Benkoelen*: Lebong, Bt. Daoen, DE VOOGD 15422 (B); *Lampongs*: P. Sebesie, Sunda Straits, DOCTERS VAN LEEUWEN 5420 (B); *Palembang*: District of Pasemak, BOSCHPR. 8134 (B), 8112 (B), 8681 (B) — Batoe radja, TEYSMANN 3526 (U) — Martapoera, BAL 13 (B) — Batoe Pantjek, FORBES 2690 (L); Central Sum., KOORDERS 21398 (B); Sumatra, KORTHALS s.n. (L); TEYSMANN 98 (L); DE VRIESE and TEYSMANN, s.n. (L); FORBES, 791 (Br. M.), 2690 (Br. M.).

Bangka S. Bangka, Rias, BOSCHPR. 15413 (B); Bangka, Herb. HASSKARL s.n. (L).

Billiton Tandjoengpandan, BOSCHPR. 8403 (B).

Anambas and Natoena Islands: P. Boengoeran, G. Ranai, VAN STEENIS 1095 (B).

Java: *West Java*: Pendjaloe, Priangan, KOORDERS 275 (L, B) — G. Malabar, FORBES, 791 (L, B), 990a (L, Br. M.), ROELOFSEN 6288 (B) — G. Moenarah, SAIMOENDI 23 (L, B) — Tjibodas, KOORDERS 42028 (B), 41815 (B), 41773 (B), 41956 (B), 13299 (B), 2798 (B), 2797 (B), 2804 (B), 2803 (L) — Tjinjiroean, RANT s.n. (B) — near Tjampea, Buitenzorg, KOORDERS 30602 (B) — Depok, KOORDERS 30946 (B) — G Pangisisan, Bantam, KOORDERS 2786 (B) — Tjidadap, south of Tjibeber, Priangan, BAKHUIZEN VAN DEN BRINK 36 (L), 3889 (L); id., WINCKEL 1160 (B) — Kemodjan, near Bandoeng, DOCTERS VAN LEEUWEN 2609 (L) — West Patoeha, near Rantjawalini, Priangan, LÖRZING 1327 (L) — Takoka, Tjiandjoer, KOORDERS 15346 (L, B), 15347 (L, B), 15348 (L, B), 25674 (L, B), 15206 (L, B), 32671 (B), 2774 (B), 36660 (B) — G Boender, Batavia, VAN STEENIS 4006 (B) — Tjikoja, Batavia, ZOLLINGER 1039 (L, K) — res. Bantam, herb. REINWARDT s.n. (L) — Buitenzorg, BLUME? s.n. (L) — Tjihandjawar, Buitenzorg, BACKER 6246 (L, B) — G. Tjisalak, coll. unknown (L) - G. Papandajan, KORTHALS? s.n. (L) — near Buitenzorg, KORTHALS s.n. (L) — G. Gede, PLOEM s.n. (L) — Palaboeanratoe, Soekaboemi, south coast, KOORDERS 33047 (L, B), 2790 (B), 11721 (B), 2788 (B), 2789 (B) — Pagentjongan, Priangan, KOORDERS 26640 (L) — Priangan, FORBES 308 (B, Br. M.) — Nanggoeng, west of Buitenzorg, BACKER 10510 (B) — G. Kendeng, near Buitenzorg, BACKER 25871 (L, B) — Baroesoelam, Bandoeng, BOSCHPR. 1333 (B) — Tjigenteng, Bandoeng, BOSCHPR. 1418 (B) — G. Galoenggoeng, KOORDERS 9915 (B) — Bandoeng, KOORDERS 2768 (B), 2799 (B) — Telagabodas, Garoet, KOORDERS 26640 (B) — between G. Semboeng and Margalangoe, BACKER 12314 (B) — near Pasir Madang, Batavia, BACKER 10476 (B) —

Bandjar, Bantardawa, Priangan, BACKER s.n. (B) — between Bajak and Langkop, Bantam, BACKER 1686 (B) — Djampangkoelon, Soekaboemi, KOORDERS 2805 (B) — Pasawahan, Priangan, BACKER 2211 (B) — near Tjipanas, Bantam, BACKER 2006 (B) — Priangan, BLUME, sub nomine *Eupatorium arboreum* (L); *Middle Java*: Pringombo (Banjoemas), KOORDERS 27113 (L) — Noesa Kembangan, TEYSMANN s.n. (L) — Dieng, Batoer, VAN DER GOOT s.n. (B) — between Madjenang and Tjisalak (Banjoemas), BACKER 18475 (B) — G. Slamat, KOORDERS 9979 (B), 2795 (B), 11862 (B), 2777 (B), 2778 (B) — Oengaran, KOORDERS 2767 (L) — Soemanding (Koedoes, Japara), BOSCHPR. 1809 (B) — Bandjarnegara (Banjoemas), KOORDERS 11177 (B), 2780 (B), 27113 (B), 33838 (B), 2779 (B), 33900 (B) — G. Kembang (Bagelen), KOORDERS 10903 (B), 37426 (B) — N.W. Prahoe (Pekalongan), KOORDERS 2787 (B) — G. Telemojo, KOORDERS 2787 (B); *East Java*: G. Wilis, BACKER 1130 (B); id. Ngebel, KOORDERS 29798 (B, L), 38833 (B), 29799 (L, B); id. G. Raidoh, KOORDERS 2769 (L, B), 34190 (B) — G. Wanasegara, BACKER 11560 (B) — Rogodjampi, KOORDERS 39023 (L) — Idjen, KOORDERS 14402 (U, L), 14401 (B) — Tjoeramanis (Djember), KOORDERS 2783 (B), 20950 (B), 2784 (B), 2785 (B), 2792 (B), 38571 (B) — Djonggo, near Poenten (Pasoeroean), LINÉE s.n. (B) — Soekaradja (Kediri), KOORDERS 23022 (B), 23831 (B) — G. Parang, KOORDERS 23044 (L, B, U); id. Gadoengan Pare, KOORDERS 22866 (B) — G. Taroep, summit, ZOLLINGER 606 (B) — G. Tengger, MOUSSET 227 (B) — id., Tosari, KOBUS s.n. (L, B), RIDLEY s.n. (K, Br. M.) — id., near Nongkodjadjar, BREMEKAMP s.n. (B) — Lawang (Pasoeroean), GUSDORF 125 (L) — Tjobanrondo, Poedjon (Pasoeroean), VAN STEENIS 2546 (B) — Banjoewangi, KOORDERS 22432 (B), 39023 (B) — Tangkil, Southern hills, KOORDERS 23662 (B) — Pantjoer-Idjen (Sitoebondo), KOORDERS 32398 (B), 14403 (B) — near Maësan (Bondowoso), ZOLLINGER 2634 (B) — Banjoewangi, G. Blaoe, BOSCHPR. 2154 (B) — north of Djoengga, BURGER 6677 (B) — Pasoeroean, Sunda Straits, BACKER 7259 (B); Java, JUNGHUHN s.n. (L, Br. M.), Pl. Jungh. ined. 53 (L, K), BLUME (sub *Eupatorium javanicum* det. BLUME) H. L. B. 901, 93—125, 126, 127, 145, 146, 147, Herb. REINW., (L), BLUME 1436 (L), BLUME s.n. (L), KORTHALS H. L. B. 901, 93 — 123, 124 (L), TEYSMANN s.n. (L), JUNGHUHN 50 (L), BOERLAGE s.n. (L), HORSFIELD 7 (K), 64 (Br. M.).

Soemba: G. Watoeata, summit, BOSCHPR. 6908 (B).

Soembawa: Rate, BOSCHPR. 13992 (B).

Borneo: *Br. N. Borneo*: near Long Kapa, G. Doelit, RICHARDS 1954 (K) — Liang gagang, HALLIER 2962 (L, B).

Flowers greyish white (BÜNNEMEYER), white (FORBES a.o.) pale violet (ZOLLINGER, KOORDERS), pale green (BOSCHPR.). Anthers blackish purple (RICHARDS). Young achenes green, old ones black (BOSCHPR.). Tree 5—34 m high, 15—104 cm thick (BOSCHPR. a.o.); stem sinuous with thick edges (KALSHOVEN).

Vernacular names: *semboeng kebo, semboeng gentoeng, (semboeng) dedek, semboeng goenoeng, semboeng sapi, semboeng koewoek, semboeng(an), semboeng gedé, semboeng gilang, semboeng (koe)wanglot, hambiroeng, ki hamiroeng, kihoe-oet, kajoe temoe hiram* (all Java), *sibernaik, siarsap, saroemarnaék, kajoe njari badak, meramboeng, sikoeboes, teta dapoer, simar galoenggoeng, landajoek, (si) tepong, temoe hiram, tilam* (all Sumatra), *nepetoeng* (Bangka), *mente poegan* (Billiton), *kajoe simboo, marambang, bareh-bareh.*

Hab.: in all kinds of forests: primeval f., second growth f., mixed f., rain f., Pinus f. (Sumatra), in jungles, in an alang alang field, along waysides, on slopes and in ravines ;acc. to KOORDERS and VALETON sometimes close to the sea. On clay, volcanic sand, limestone and on rocky soils, solitary or numerous

Altitude: 10—3000 m. JUNGHUHN (1837) noticed this variety in the mountain forests of his second zône (600—1350 m).

Flowers during the whole year.

Use: According to HEYNE l.c. the wood is very light, not strong and not durable and it is not much used. In Kediri it is used for making matches and match-boxes (acc. to HEYNE). Though the wood is soft, it is sometimes used for building houses (acc. to KOORDERS), but, as a rule, the wood is considered to yield a bad timber. In Sumatra the bast is used against sprue (acc. to HEYNE).

Distribution: Ceylon!, Burma! (leaves very white beneath), Assam!, Mal. Penins.!, Penang!

Small galls are to be found sometimes on the lower side of the leaves (Noesa Kembangan, TEYSMANN s.n., L).

Though the extreme forms of *V. arborea* and *V. javanica* are to be distinguished well, in some specimens of *V. javanica* the involucral scales are nearly quite glabrous, the leaves are thinly crispy tomentose beneath (which we find occasionally also in specimens of *V. arborea:* Bandjar, Bantardawa, BACKER—Bondowoso, near Maësan, ZOLLINGER). For this reason I prefer to follow CLARKE in considering *V. javanica* as a variety of the closely allied *V. arborea.*

A specimen of *V. arborea* var. *javanica* with extremely small involucral scales (inner ones not longer than 1½ mm) has been collected in the Mentawei Islands (P. Siberoet, BODEN-KLOSS 14631, B).

MIQUEL distinguishes *Vernonia javanica* (BL.) DC. var. *oblongata* MIQ.! (Fl. Ind. Bat. II (1856) 10), which has oblong or sublanceolate leaves. It does not seem possible to distinguish this variety, as the leaves in *Vernonia javanica* are very variable.

3. var. **conferta** (DC.) nov. comb.; *Vernonia javanica* (BL.) DC. var. *conferta* DC. Prod. V (1836) 22; ZOLL. in Nat. Gen. Arch. Neêrl. II (1845) 218; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ. Fl. Ind. Bat. II (1856) 10.

Internodes short. *Leaves* elliptic, shortly tapering at the base, fairly long acuminate at the top, acute or nearly so at both ends; upper

ones thinly villous, tomentose on the nerves beneath (hairs of the leaves crispy, rusty, on the main nerves mixed with long flexible greyish ones), lower leaves subglabrous beneath (except on the nerves); nerves very prominent beneath; lateral ones about 12 pairs; blades 8—17½ cm long, 2½—5½ cm broad; petioles 1—2½ cm long. *Inflorescence* compact, densely branched, shortly and broadly pyramid-formed, 9—13 cm wide, 8—10 cm high. *Involucre* large, 3—4 mm long, densely rusty tomentose like the branches of the inflorescence. *Corolla* and *achene* like those of *V. arborea* var. *javanica*. *Pappus*-hairs coarse.

Distribution in the Malay Archipelago:

J a v a: *West Java*: W. Patoeha, near Rantjawalini, LÖRZING 1307 (L, B) — G. Salak, Tjiapoes, waterfalls, KORTHALS? (L) — G. Papandajan, KORTHALS s.n. (L) — G. Malabar, Poentjak gedeh, MONTÉRIE 29 (L, B, K) — Tjibodas, KOORDERS 12480 (L, B), 2806 (B), 2807 (L), HALLIER 416 (B), SAPIIN 209 (U) — Geger Bintang (Priangan), DEN BERGER 553 (B) — G. Telagabodas, KOORDERS 26716 (B) — Kandang badak, KORTHALS s.n. (L) — G. Semboeng (Batavia), north slope, near Tjisaroea, VAN STEENIS 5159 (B) — Java, JUNGHUHN s.n. (L), KOORDERS 2800 (L), 12481 (L, K), 12483 (L), 12601 (L); Java ?, BLUME s.n. (L).

Flowers dingy white (KOORDERS). Tree 10—23 m high, 35—70 cm thick.

Hab.: in primeval forests.

Altitude: 900—2000 m.

Flowers: Jan.—March, June, Sept.

Though I did not find the type specimen of this variety, the specimens cited most probably belong here, as they quite agree with the description of DE CANDOLLE. It is not always easy to separate this variety from *V. arborea* var. *javanica*, when the shape of the leaves is about the same. In this case the scarce pubescence of the leaves and the long hairs on the midrib are differences, though on some specimens of *Vernonia arborea* var. *javanica* some long hairs may be found on the midrib as well.

4. var. **incana** KOORDERS! et VALETON! in Meded. L. Pl. XXXIII (1900) 54; *Vernonia javanica* (BL.) DC. var. *minor* MIQ.! Fl. Ind. Bat. II (1856) 10.

Leaves and *branches* more or less densely crispy pale greyish fulvously villous beneath. Leaves smaller, elliptic or ovate; blades 4—10 cm long, 1½—3½ cm broad. *Inflorescence* leafy. *Involucral scales* glabrous or nearly so. *Achene* glabrous, minutely glandular.

Distribution in the Malay Archipelago:

J a v a: *West Java*: Takoka (Tjiandjoer), KOORDERS 25554 (L, B); *East Java*: Sitoebondo, Pantjoer-Idjen, KOORDERS 2809, det. VALETON (B) — G. Wilis, Ngebel, KOORDERS 23091, det. KOORDERS s.n. (L, B), 2765 (L) — near Malang, KALSHOVEN XVII (B) — Rogodjampi (Djember),

KOORDERS 22432 (B), 2770 (L, Br. M.), 2772 (L) — Bantoer (Pasoeroean), BACKER 30459 (L) — Blambangan (Djember), HORSFIELD s.n. (L, K, U) — Koedoes, BOSCHPR. 1798 (B), leaves subacute at the base; Java, ZOLLINGER 1039 (K), DE VRIESE et TEYSMANN s.n. (L).

Vernacular names: *semboengan* (Java).

Tree 10—31 m high, 31—40 cm thick (BOSCHPR., KALSHOVEN).

Hab.: in forests, on a rocky soil; rather common.

Altitude: 300—800 m.

Flowers: March—June, Aug., Oct., Nov.

The type specimen of *Vernonia javanica* (BL.) DC. var. *minor* MIQ. (H. A. B. T. 026662) is provided with a label, on which is written in the handwriting of MIQUEL: „Vernonia javanica DC. var. minor—Java—Horsfield". In the Leiden Herbarium another specimen is to be found, which seems to be collected from the same tree. To this specimen a label is added, on which is written by MIQUEL: „Java" (H. L. B. 904, 235—98). Both specimens may have been collected in Blambangan, according to MIQUEL l.c. Some specimens of this variety, where the leaves are thinly villous beneath, are difficult to be distinguished from *Vernonia arborea* var. *typica*.

5. var. **mollissima** (RIDLEY) nov. comb.; *Vernonia javanica* DC. var. *mollissima* RIDLEY! Fl. Mal. Penins. II (1923) 187.

Branches and *leaves* beneath densely velvety villous; hairs not crisped, but curved or nearly straight. *Involucral scales* villous. *Corolla* 5—6 mm long, lobes 1½—2 mm long. *Achene* subglabrous or glabrous, glandular.

Distribution in the Malay Archipelago:

S u m a t r a: *East Coast*: Asahan, plateau of Karo, BARTLETT and LA RUE 234 (L) — id., Goerach Batoe, YATES 1854 (B), 2115 (L, B) — Semeloengan, BOSCHPR. 4888 (L, B) — near Brastagi, Sibolangit, LÖRZING 4126 (B) — East Coast, YATES 1294 (L, B); *Tapanoeli*: Angkola and Sipirok, BOSCHPR. 4164 (L, B), 5639 (L, B); *Lampongs*: G. Soegih, GUSDORF 125 (L, B); Sumatra, KORTHALS 998 (L).

B o r n e o: *Br. N. Borneo*: G. Kinabaloe, Penataran basin, CLEMENS 34161 (L, B); Banguey Island, CASTRO and MELEGRITO 1508 (B, Br. M.), 1487 (B); N. Borneo, G. Moeara Togal, AMDJAH 138 (B, K).

Flowers pale green (LÖRZING), white (GUSDORF), grey (CLEMENS).

Vernacular names: *saroeng marnakik, kajoe temoe hiram, simar galoengoeng bernaik* (all Sumatra).

Hab.: in second growth jungle, in old forests.

Altitude: 30—1600 m.

Flowers: April—July, Sept., Oct.

Distribution: Mal. Penins.!

6. var. **obovata** MOORE in Journ. Bot. LXI (1923) suppl. 27; *Vernonia arborea* LAUTERBACH! in Nova Guinea VIII 4 (1912) 863 (non alior.)

Flowering *branches* shortly glandularly ferrugineously villous (hairs nearly straight), 5—10 mm thick; lower parts subglabrous, glandular. *Leaves* long petiolate (petioles 1½—5 cm long, villous like the branches), broadly elliptic, obovate-elliptic, rarely ovate-elliptic, very shortly abruptly acuminate at tip (tip broad or narrow, blunt, ½—1½ cm long), very rarely rounded at tip, shortly thinly pubescent beneath (hairs very short, nearly straight) rarely glabrous, clearly glandularly spotted at both sides, rigidly coriaceous; blades 7—33 cm long, 4—10 cm broad; very young leaves densely villous at both sides. *Involucral scales* spreading, densely villous, glandular at the superior part (hairs appressed), rounded at tip ciliate at the edges; interior ones oblong. *Achene* glabrous, clearly glandular (glands often prominent). *Pappus* uniseriate.

Distribution in the Malay Archipelago:

S u m a t r a: *West Coast*: G. Koerintji, ROBINSON and KLOSS 45 (Br. M.); *Djambi*: Pahoe, POSTHUMUS 1060 (U, B); *Palembang:* PRAETORIUS s.n. (L), coll. unknown (U); Middle Sumatra: S. Glawan, KOORDERS 21386 (B).

B a n g k a: coll. unknown (L, B, U).

B o r n e o: *West*: G. Kenepai, foot, HALLIER, 1613 (L, B) — P. Lemoekoetan, HALLIER 303 (L, B) — Sanggouw, HALLIER 899 (L, B) — G. Klam, foot, HALLIER, 2497 (L, B, K), Karimata Arch., P. Karimati besar, MONDI 202 (L, B) — S. Rikai, HALLIER 1297 (L, B) — S. Aja Kapoeas, TEYSMANN 8305 (B) — Kapoeas, Sei Bakambat, ABAR BIN ADAN 2145 (B) — Pontianak, BOSCHPR. 12635 (B) — S. Kapis, DELMAAR 1914 (L, B); *South East*: Sampit, KAHAR 2011 (L, B) — Banjermasin, KORTHALS s.n. (L), MOH. DACHLAN 16b (B), MOTLEY 68 (K) — Pleihari, BOSCHPR. 1832 (B), 14161 (B) — Balikpapan, BOSCHPR. 13917 (B) — Poewelitjahoe, near kampong Toepoeli, BOSCHPR. 10604 (B) — near Tanah grogot, BOSCHPR. 9546 (B) — Central Doesoen, BOSCHPR. 3893 (B); *Sarawak*: upper Rejang River, Gat, CLEMENS 22182 (B, K) — Koetjing, BARTLETT s.n. (Br. M.) — Sarawak River, HAVILAND 88 (K) — P. Laboean, MOTLEY 385 (K) — Sarawak, NATIVE COLL. 728 (Br. M.); *Br. N. Borneo*: Sandakan, Lumat, Beaufort, PASCUAL 2380 (B) — Tawao, ELMER 21030 (B, U, Br. M.) — Raningan, plain near Apin Apin, GIBBS 2973 (K, Br. M.) — Kg. Lasak, GOBLIN 2498 (K) Tenompok, CLEMENS 26873 (L, B, K) — G. Boengal, CLEMENS 11207 (B) — Peniboekan, G. Kalawat, CLEMENS 30537 (L, B), 11176 (B); Borneo: KORTHALS s.n. (L), JAHERI s.n. (B), BECCARI 288 (B, K), LEWE 36 (K), BARTER s.n. (K).

C e l e b e s: *Minahassa*, near Ratatotok, KOORDERS 16504 (L, B) — id. near Kajoewati, KOORDERS 16495 (L, B), 19220 (L, B) — id. near

G. Lokon, KOORDERS 16507 (L, B) — id. G. Klabat, KOORDERS 19218 (L, B) — id. near Kawoeng, KOORDERS 16504 (B) — Kendari, Poehara, KJELLBERG 741 (B) — G. Kendari, KJELLBERG 672 (L, B) — P. Moena, Wakadea, BOSCHPR. 5424 (L, B, K).

Moluccas: *Ternate*: Foramadiahi, BEGUIN 1163 (B), 1468 (L, B).

Flowers pale green (KOORDERS), pale yellow (KOORDERS, BOSCHPR.), dirty yellow and violet (KOORDERS), pale green with violet tip (BEGUIN), white (CLEMENS, GOBLIN), dirty flesh-coloured, grey (CLEMENS), violet-white (KJELLBERG); strongly smelling of honey (KJELLBERG), having a ranced smell (BOSCHPR.). Tree 9—30 m high, 9—49 cm thick, branches spreading (CLEMENS), stem sinuous, lower part much grooved (BEGUIN).

Vernacular names: *raimanto, kajoe tema, pamaloe, meramboetang* (all Sumatra), *setepoegan* (Bangka), *tapon tapon, meremboeng, maramboeng, mentepoeng, naman boeng, maramboeng, latong, slepong, taoe otjang, katotepong* (all Borneo), *molo patoeng* (Dajak), *lelema, naloso, lajo, kai tai* (all Celebes), *rogo monggané* (Moena), *gofasa gaba* (Ternate).

Hab.: in forests, in jungles, also close to the water; on clayish, sandy and boggy soils, on volcanic sand, on tuff; rare to common.

Altitude: 0—2250 m.

Flowers: Sept.—April, June, July.

Use: the wood is soft and not to be used for timber (coll. of Bangka) KOORDERS, however, mentions it to be useful and MOTLEY considers it excellent for house-work. It is reddish white (MOTLEY).

Distribution: New Guinea, FORBES 523 (L), 653 (L, K), GJELLERUP 413 (L, B, K, U), LANE POOLE 429 (K).

Though the specimens from New Guinea and Ternate have obovate leaves with narrow long tips and those from Sumatra, Borneo and Celebes have broadly elliptic leaves with short broad tips, as a rule, there is no reason to keep them apart.

7. var. **simalurensis** nov. var.

Folia late elliptica, apice abrupte longe et anguste acuminata (acumine ad 2 cm longo), subtus breviter pubescentia (pilis suberectis), laminae 11—18½ cm longae, 6—9 cm latae. *Squamae involucri* subglabrae. *Corolla* tubuloso-infundibuliformis, 4½ mm longa; lobis 1½ mm longis. *Achenium* glabrum, parce glandulosum.

Distribution in the Malay Archipelago:

Simaloer, near Sumatra, ACHMAD 250 (L), type specimen, (B, U), 17 (L), 722 (L), 170 (L).

Vernacular names: *boelinai, betoe betoe balal valah, kapeh dotan (oeding)*.

Flowers: Jan., Febr., Nov.

8. var. **papanensis** nov. var.

Rami parte superiori ferrugineo-villosi. *Folia* elliptica vel obovato-elliptica, apice brevissime et late acuminata, subtus sparse crispe pubescentia, utrinque manifeste glanduloso-punctata, coriacea; laminae 10—

15 cm longae, 4½—6½ cm latae. *Paniculae* corymbosae. *Squamae involucri* ovato-ellipticae, subglabrae, glandulosae, apice obtusae, margine ciliatae. *Achenium* glaberrimum, dense glandulosum.

Distribution in the Malay Archipelago:

Riouw Arch.: P. Papan, BÜNNEMEYER 7791 (L), type specimen, (B, U).

Sumatra: *West Coast*: Baros, TEYSMANN 1040 (B, U) — Padang, HEYNE 18 (B).

Borneo: Boekit Batoe Lessoe, AMDJAH s.n. (B), very young buds; Borneo, KORTHALS s.n. (L).

Vernacular name: *merantong*.

Altitude: 15 m.

Flowers: Sept.

Distribution: Mal. Penins.'

This variety is allied to *V. arborea* var. *obovata*, but it is to be distinguished by the involucral scales

9. var. **celebica** (BL.) nov. comb., *Eupatorium celebicum* BL. Bijdr. (1825) 903; *Vernonia celebica* DC. Prod. V (1836) 21; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 217, MIQ. Fl. Ind. Bat. II (1856) 9; KOORDERS in Meded. L. Pl. XIX (1898) 510; *Vernonia arborea* HOOK. Fl. Br. Ind. III (1882) 239 (p.p.); GAGNEP. in LEC. Fl. Indo-Chine III (1924) 466 (p.p.).

Leaves elliptic-oblong or oblanceolate-oblong, more or less attenuate at the base, abruptly accuminate at the top (tip narrow, often elongate, ½—2 cm long, obtuse or nearly acute), glabrous or subglabrous beneath, glabrous above, glandularly spotted at both sides; lateral nerves 6—9 pairs; blades 6—14 cm long, 2—4 cm broad. *Heads* 4—5-flowered. *Involucre* 4—5-seriate; scales glabrous or subglabrous, ciliate along the margin, narrowly oblong (½—1 mm broad), obtuse or acute at the top. *Achene* glabrous, glandular. *Pappus* biseriate.

Distribution in the Malay Archipelago:

Celebes: *S.W. Celebes*: G. Bonthain, BÜNNEMEYER 11982 (L, B, U, K) — Bonthain, BOSCHPR. 5463 (B), TEYSMANN 14041 (B) — Lombasang, BÜNNEMEYER 11701 (L, B); Celebes, Todjamboe, KJELLBERG 1821a (B) — G. Loekon ?, coll. unknown, det. MIQ. (U), Celebes, BLUME s.n. (L), KORTHALS s.n. (L).

Flowers pale violet, fragrant (BÜNNEMEYER)

Vernacular name: *soengoe mamai*.

Hab.: in forests.

Altitude: 1000—2200 m.

Flowers: Jan., April—August.

In two specimens (TEYSMANN 14041, BÜNNEMEYER 11701) we find instead of some of the heads dense glomerules (5 mm long and as thick), consisting of very small hirsute bracts, which are uni-nerved, 2½—4 mm long and ½—1 mm broad and of which the lower part is glabrous and thickened. The outer rows of the involucral scales are normal.

In the Leiden Herbarium two specimens of this variety seem to be confused. To H. L. B. 901, 93—115 is added a label on which KORTHALS has written: „Eupatorium celebicum-Herbar". To H. L. B. 901, 93—114 two labels are added: one, on which DECAISNE has written: „Strobocalyx celebicus Bl.—Java—Blume 1836" and another one, on which MIQUEL has written: „Vernonia celebica DC. — an e Java?" Moreover a specimen of *Microglossa volubilis* DC. is preserved in the Leiden Herbarium (H. L. B. 900, 361—245), to which is added a label of the Herbarium Reinwardtianum and another one, on which REINWARDT has written „1009 a Eupatorium arboreum — Celebes, montis Lukkon et Bumangan — October 1821". MIQUEL had added a label to this sheet, on which he has written: „Vernonia celebica DC". BOERLAGE supposed, as appears from labels added to each of the specimens dealt with, that H. L. B. 901, 93—115 was the specimen of *Vernonia celebica* (BL.) DC. of REINWARDT, cited by MIQUEL, of which the labels might have been commutated with those of the specimen of *Microglossa volubilis* DC. (H. L. B. 900, 361—245), which had been collected by KORTHALS in Java. H. L. B. 901, 93—114 might be a duplicate of the specimen, cited by MIQUEL and sent to Paris by BLUME, but returned with a wrong label.

This supposition is not supported by the following facts:

1. KORTHALS wrote on the label of H. L. B. 901, 93—115: „Eupatorium celebicum".

2. The name „Eupatorium arboreum", that was given by REINWARDT to *Microglossa volubilis* DC., is also to be found on the labels of the specimens H. L. B. 900, 148—465 and H. L. B. 900, 361—246 (both specimens of *Microglossa volubilis* DC.) and was written by REINWARDT. Besides BLUME has written on a label of REINWARDT, added to H. L. B. 900, 148—465: „Conyza prolifera L". This was the name, BLUME gave to *Microglossa volubilis* DC., as appears from a label, belonging to another specimen of this species (H. L. B. 900, 361—231), on which BLUME wrote: „Conyza prolifera Lam.—Java" and his initials.

We may therefore conclude:

1. No type specimen of *Vernonia celebica* (BL.) DC. is to be found in the Leiden Herbarium, but there is a specimen of BLUME, labelled by DECAISNE; it is erroneously recorded from Java.

2. *Eupatorium arboreum* REINW. is a synonym to *Microglossa volubilis* DC., as well as *Conyza prolifera* BL.

3. The specimen of *Vernonia celebica* (BL.) DC., cited by MIQUEL, is not extant in the Leiden Herbarium.

4. MIQUEL has confused a specimen of *Microglossa volubilis* DC. with fairly young heads with *Vernonia celebica* (BL.) DC.

Vernonia celebica is not the species described by ELMER (Leafl. Phil. Bot. VII, 1915, 2591) and named *Vernonia urdanetense*, as ELMER l.c. and MERRILL (Enum. Phil. III, 1923, 595) suppose. In the latter the achenes are densely pubescent and without glands, the involucral scales are pubescent.

10. var. **sumatrensis** nov. var.

Folia oblongo-elliptica, glabra. *Capitula* 4—5-flora. *Squamae involucri* glabrae. *Corolla* parva, demum eglandulosa, 3½—4 mm longa, tubo tenui, aequicrasso, 1½—2 mm longo, limbo 2 mm longo; lobis limbo subaequilongis, angustis, lanceolatis, apice acutis, patentibus. *Achenium* dense minute glandulosum, glabrum.

Distribution in the Malay Archipelago:

Sumatra: *Bengkoelen*: Liwa, DE VOOGD 50 (L), type specimen, (B) — Soeban ajam. Exped. JACOBSON 269 (L, B) — Redjang, ENDERT 1069 (L, B); *West Coast*: G. Koerintji, BÜNNEMEYER 8998 (L, B, K), 9088 (B), 9160 (B, U).

Flowers white, grey (BÜNNEMEYER). Tree 20 m high, 35 cm thick (ENDERT); shrub (BÜNNEMEYER).

Vernacular names: *meramboeng redjang, samahan.*

Hab.: in a forest.

Altitude: 800—2000 m

Flowers: March—July, Dec.

The specimens of Bengkoelen have small leaves, which are oblong-lanceolate; blades 5½—12½ cm long, 1½—2½ cm broad.

11. var. **kenepaiensis** nov. var.

Folia elliptica, utrinque sensim attenuata, acuta, longe petiolata (petiolo 1½—2 cm longo), subtus sparse hirsuta (pilis brevibus, curvatis, ad basin saepe bullatis), paulo glandulosa. *Inflorescentia* corymbosa. *Squamae involucri* glabrae *Achenium* glabrum, minute glandulosum.

Distribution in the Malay Archipelago:

Borneo: G. Kenepai — HALLIER 1858 (L), type specimen, (B, K).

12. var. **grandifolia** nov. var. *)

Leaves broadly elliptic, shortly acuminate at the top (tip nearly rounded, 5 mm broad), gradually attenuate at the base, subacute or subobtuse, sparsely pilose, slightly glandular above, pubescent beneath, (hairs short, curved, thickened at the base) extreme nerves minutely reticulate, very prominent at each side. *Heads* 6-flowered, 12 mm long. *Involucral scales* glabrous. *Corolla* narrowly tubular, 7—8 mm long; lobes linear-lanceolate, very acute at the top, 2 mm long. *Achene* glabrous, minutely glandular, 3½ mm long.

Distribution in the Malay Archipelago:

Borneo: Sarawak, G. Doelit, RICHARDS 1734 (K), type specimen.

Hab.: on bank of stream on edge of cliff.

Altitude: 1200 m.

Flowers: Sept.

*) The latin description will be published in „Bulletin of miscellaneous information, Royal Botanic Gardens, Kew."

13. var. **pilifera** nov. var.

Rami crebre foliati, pilis longis fulvis irregulariter vestiti (pilis ad ½ cm longis, nonnullis brevibus bullosis et glandulis cylindricis numerosis intermixtis); internodia 2—15 mm longa. *Folia* breviter petiolata vel subsessilia (petiolo ½—1 cm longo, piloso, glanduloso-verrucoso), obovato-oblonga vel elliptica-oblonga, apice breviter attenuata vel abrupte breviter acuminata (acumine ½ cm longo, obtusa vel subacuto), nervis subtus pilis longis (3 mm longis), fulvis et pilis brevissimis bullosis dense vestitis, laminis supra glabris (nervo primario piloso excepto), utrinque dense glanduloso-verrucosis (glandulis prominentibus), subtus sparse pilosis (pilis brevibus curvatis, ad basin incrassatis), 5½—17 cm longis, 2½—5 cm latis; folia iunioria pilis longis dense vestita. *Rami inflorescentiae* nervorum modo dense vestiti. *Involucri squamae* subglabrae.

Distribution in the Malay Archipelago:

S u m a t r a: *East Coast*: Karo-districts, BOSCHPR. 2767 (B), type specimen, (L), 8616 (B), 6231 (B) — Karo-plateau, HOUTVESTER SUM. WESTKUST 7 (B); *West Coast*: Oud Agam, BOSCHPR. 5519 (B), 5841 (B), 6673 (B).

Flowers white, non-odoriferous (BOSCHPR.). Tree 25—36 m high, 45—65 cm thick.

Vernacular names: *maramboeng, sibernaik, madang gadjah, boernaik* (all Sumatra).

Hab.: in old forests; on a clayish or a stony soil; scattered or many together; locally common.

Altitude: 1000—1500 m.

Flowers: Jan.—April, July.

On the sterile branches the leaves are sparingly dentate, up to 14½ cm long and 7 cm broad.

Vernonia florescens ELMER! (Leafl. Phil. Bot. II, 1910, 685) seems to be merely a form of *Vernonia arborea*, having no essential differences; its leaves are slightly crispy pubescent beneath.

(2) **Vernonia patentissima** nov. spec.

Arbor. *Rami* floriferi, 3—7 mm crassi, subteretes, striati, breviter fusco-pubescentes, internodiis 2—½ cm longis, cicatricibus foliorum deltoideis. *Folia* alterna, petiolata (petiolo 1—2 cm longo, fusco-pubescenti, gracili, plus minusve 1 mm crasso, subtereti), obovato-oblonga, basi subacuta, saepe inaequalia, apice breviter et obtuse mucronata (mucrone 2—7 mm longo), coriacea, integerrima, pinninervia (nervis utrinque prominentibus, lateralibus 24—30, apice arcuate connectis; extremis distincte reticulatis), supra minutissime verruculosa, sublucida, utrinque glaberrima (nervo centrali pubescenti excepto), laminis 6½—14 cm

longis, 3—5 cm latis. *Inflorescentia* terminalis et apice ramulorum superiorum, paniculata, ampla (12—24 cm lata, 16—24 cm alta), ramis alternis, inferioribus in axillis foliorum, in parte inferiore nudis, apice ramosis, subangulosis, fusco-pubescentibus, extremis dense fulvo-villosis, capitula 2—3 ferentibus *Capitula* homogama, cylindracea, longe pedunculata (pedunculo 3—8 mm longo, dense fulvo-villoso, interdum parte superiore bracteis 2 vel 3 minutissimis praedito), 10-flora, 11 mm longa. *Involucrum* 5—6 seriatum, squamis externe decrescentibus, margine ciliatis, interne lucidis, dorso glabris, vel apice parce pubescentibus, serierum interiorum late oblongis, apice rotundatis, 2 mm latis, 3½ mm longis, exteriorum late ovatis, apice rotundato-obtusis; serieri extremi subdeltoideis, apice obtusis, 1½ mm longis et latis. *Flores* bisexuales. *Corolla* tubuliformis, apice 5-lobata (lobis brevibus, apice acutis, 1½ mm longis, minusquam ½ mm latis), glabra, eglandulosa, 9 mm longa. *Antherae* ad basin sagittatae, apice subacutae. *Stylus* bifurcatus, rami 4 mm longi, subacuti, externe papillosi. *Achenium* (immaturum) turbinatum, costatum, glabrum, (apice subpubescenti excepto), eglandulosum, obscurum; basi annulo cartilagineo praedito. *Pappus* subuniseriatus, setosus, 8 mm longus, setis fulvo-albidis, ciliatis, aequilongis, perpaucis brevissimis intermixtis. *Receptaculum* planum, foveolatum, cicatricibus florum angulosis, processo centrali aculeiformi praedito.

Distribution in the Malay Archipelago:

Sumatra: *Benkoelen*, Lebong, RENWARIN 2297 (L), type specimen, (K).

Flowers white (RENWARIN). Tree 33 m high, 39 cm thick.

Vernacular name: *mamboeng oetan* (Sumatra).

Hab.: in an old mountain forest.

Flowers: July.

Allied to *Vernonia arborea*, but easy to be distinguished by the 10-flowered heads and the involucral scales, which are rounded at the top. To be distinguished from *Vernonia talaumifolia* HOOK. f et TH by the shape of the leaves.

(3) **Vernonia amboinensis** nov. spec.

Arborea? *Rami* floriferi lignosi, teretes, obsolete striati, breviter fulvo-albide glanduloso-villosi, lenticellati, parte superiore sensim attenuati, 3—7 mm crassi. *Folia* alterna, petiolata (petiolo breviter villoso modo ramorum, 2½—4½ cm longo, 1½ mm crasso), oblonga vel ovato-oblonga, basi breviter attenuata, acuta vel rotundata, inaequilateralia, apice acuminata (apice multo attenuato, interdum angustissimo, 1—2 mm lato, satis longo vel longissimo, 1—2½ cm longo, obtuso vel subacuto) vel rotundata, pinninervia (nervis lateralibus utrinque 9—11, subtus prominentibus, extremis reticulatis), integra, utrinque glabra (nervo princi-

pali parce pubescenti, subtus glandulosa; laminis 11½—20 cm longis, 4—7 cm latis, cicatricibus foliorum triangularis. *Inflorescentia* terminalis, ampla, paniculata, 17—28 cm lata, 20 cm alta, ramis teretibus, obsolete striatis, breviter fulvo-albide glanduloso-villosis, parte inferiore maiore eramoso, inferioribus sensim longioribus, nonnullis ramificationibus minoribus basi folio parvo vel bractea lineari villosa (1—4 mm longa) praedito, extremis capitula 2—4 ferentibus. *Capitula* pedunculata vel subsessilia (pedunculo ad 1 mm longo), oblonga, homogama, 2—3-flora, 8—10 mm longa. *Involucrum* parvum, 4-seriatum, subcampanulatum, squamis subglabris vel apice parce pubescentibus, glandulosis, margine ciliatis, apice obtusis, oblongo-ovatis; interioribus 2 mm longis. *Flores* bisexuales. *Corolla* anguste infundibuliformis, sparse glandulosa, 6—8 mm longa, 5-lobata, lobis lanceolatis, acutis, 2 mm longis. *Stylus* bifurcatus; rami subacuti. *Antherae* ad basin longiter sagittatae, apice subobtusae. *Achenium* turbinatum, uno latere complanato, costatum (costis plus minusve 8), glandulosum, pubescens, 2 mm longum, annulo basali calloso praeditum. *Pappus* setaceus, uniseriatus, 5½ mm longus; setis albidis, nonnullis brevibus intermixtis. *Receptaculum* planum, cicatricibus florum disciformibus, processo centrali aculeiformi praeditis.

Distribution in the Malay Archipelago:

M o l u c c a s: Amboina, De Vriese et Teysmann s.n. (L) H. L. B. 901, 93—89, type specimen, Teysmann 5112 (U, B).

Flowers violet (Teysmann).

To be distinguished from *Vernonia arborea* by the 2—3-flowered heads.

(4) **Vernonia durifolia** nov. spec. — Pl. II, 9—10.

Arborea. *Rami* floriferi subteretes, lignosi, 6—8 mm crassi, crebre foliati, in parte superiore dense breviter fusco-villosi, obsolete striati, cicatricibus foliorum magnis, deltoideis; internodiis brevibus, plus minusve 1 cm longis. *Folia* alterna, petiolata (petiolo 1—2½ cm longo, dense fusco-villoso, supra sulcato, 2—3 mm crasso) late elliptica, basi rotundata vel subrotundata, apice abrupte brevissime mucronata (mucrone lato, obtuso, vel subrotundato), integra, pinninervia (nervis utrinque prominentibus, nervo primario utrinque, nervis lateralibus subtus dense fusco-villosis; lateralibus utrinque 6—7, apice arcuatim connectis; extremis reticulatis, supra glabra vel subglabra, lucida, subtus pubescentia, utrinque dense glandulosa (glandulis prominentibus), manifeste coriacea; laminae 6—9 cm longae, 4—6½ cm latae; superiores minores. *Inflorescentia* et terminalis et apice ramorum superiorum, compacte corymboso-paniculata, 10—20 cm lata, 5—12 cm alta, ramis alternis in axillis foliorum minorum (laminis 6—2½ cm longis, 4—2 cm latis), fusco-villosis, interdum medio

foliis parvis nonnullis praeditis, parte inferiore eramosa, apice ramosissima; ramificationibus extremis fusco-villosis bractaea minuta fusco-villosa praeditis. *Capitula* pedunculata (pedunculo fusco-villoso, 1—3 cm longo, 1 mm crasso), 1 cm longa, 5-flora, homogama, cylindracea. *Involucrum* oblongum regulariter 6—7 seriatum, laxe imbricatum, squamis plus minusve 12, parce pubescentibus vel glabris, margine ciliatis, glandulosis; seriei interioris oblongo-ellipticis, apice obtusis vel rotundatis, 3—2½ mm longis, 1½ mm latis; serierum exteriorum late ovatis vel deltoideis, apice obtusis; seriei secundae 2 mm longis, 2 mm latis; seriei tertiae 1½ mm longis, 2 mm latis; extremis minutis. *Flores* bisexuales. *Corolla* anguste infundibuliformis, 6—7 mm longa, eglandulosa, 5-lobata; lobis linearibus, apice attenuatis, acutis, 3 mm longis. *Antherae* ad basin sagittatae, apice subacutae. *Stylus* bifurcatus; rami incrassati, breves, apice subobtusi. *Achenium* oblongum, basi attenuatum, sub-semiteres, lateraliter compressum, sub-5-angulatum, glabrum, dense minute glandulosum, 3 mm longum, 1 mm crassum, basi annulo cartilagineo praeditum. *Pappus* subbiseriatus, setosus; setis fulvo-albidis, 6—7 mm longis, nonnullis parvis intermixtis (1 mm longis). *Receptaculum* parvum, planum; cicatricibus florum disciformibus, processo centrali aculeiformi praeditis.

Distribution in the Malay Archipelago:

S u m a t r a: *West-Coast*: G Malintang, BÜNNEMEYER 4062 (L), type specimen, G. Talamau, N.W. slope, BÜNNEMEYER 793 (L) -- G. Merapi, BÜNNEMEYER 5000 (B), 4676 (B).

Flowers white (BÜNNEMEYER).

Hab.: in jungles.

Altitude: 2000—2600 m.

Flowers: May, July, Sept.

Though this species is closely allied to *Vernonia arborea* var. *papanensis* it seems to be a good species, differing in the shape of the leaves, the involucre and the corolla. It is limited to some few mountains close together. The specimens examined are very uniform.

(5) **Vernonia kabaënsis** KOSTER in Fedde Repert. XXXIV (1933) 1 — Pl. II, 11—12.

Tree? *Branches* woody, terete, obscurely ribbed, densely leaved, densely and shortly fulvously villous, 3 mm thick; cicatrices of the leaves thickened, nearly semi-circular. *Leaves* shortly petiolate (petiole 3 mm long, 1 mm thick, curvate and thickened at the base), elliptic-obovate, attenuate, acute or obtuse at the base, shortly acute or obtuse at the top, entire, pinni-nerved (nerves prominent at both sides, 4—6 pairs of lateral nerves; extreme ones reticulate) subglabrous except the slightly pubescent nerves, black-spotted, densely glandular at both sides, recurved

at the edges, coriaceous, dark green above, paler beneath; blades 1½—3 cm broad, 4½—8½ cm long. *Inflorescence* paniculate, terminal, to 8 cm wide, to 15 cm long; branches alternate, fulvously villous, having a small leave at the base and bearing many corymbosely clustered heads. *Heads* cylindric, pedunculate (peduncles 1—2 mm long), one-flowered, 1 cm long. *Involucre* 5-seriate; scales caducous, shortly pubescent at the top, ciliate along the margins; interior ones oblong, more or less acute at the top, 1 mm broad, 5 mm long, exterior ones ovate, obtuse at the top, more than ½ mm broad, 1 mm long. *Flowers* 9 mm long. *Corolla* tubular, densely glandular, 6 mm long, 1 mm wide, 5-lobed (lobes 2 mm long, acute at the top, lanceolate). *Anthers* long sagittate at the base, obtuse at the top. *Style*-branches long, acute. *Achene* narrowly turbinate, 10-ribbed, densely glandular, glabrous, 2½ mm long. *Pappus* dingy whitish, biseriate, setaceous; inner row 6 mm long; exterior one 2 mm long. *Receptacle* flat, glabrous, small.

Distribution in the Malay Archipelago:

Celebes: P. Kabaëna, Sangia-wita hills, GRÜNDLER 3453 (L), 3495 (L).

Hab.: in jungles; on a dry soil.
Altitude: 600—900 m.
Flowers: Oct.

(6) **Vernonia fimbrillata** nov. spec. — Pl. II, 8.

Arborea? *Rami* floriferi striati, scabride hirsuti (pilis curvatis, brunneis), glandulosi, 3 mm crassi, internodiis 1—2 cm longis. *Folia* alterna, pedunculata (pedunculo scabride hirsuto, 1—1½ cm longo), obovato-elliptica, basi longe in petiolum attenuata, apice abrupte acuminata ibi lato, obtuso vel subrotundato, plus minusve ½ cm longo, pinninervia (nervis lateralibus utrinque 6—7, extremis reticulatis; omnibus prominentibus) utrinque glandulosissima, supra subnitida, glabra, subtus glabra, coriacea, integra; laminae 6—8½ cm longae, 2.3—3 cm latae; superiorum gradatim minori, ad 1.3 cm latae, 3 cm longae. *Inflorescentia* corymboso-paniculata; rami in axillis foliorum parvorum inferne nudi; superne capitula plus minusve 10 ferentes. *Capitula* pedunculata (pedunculis 2—5 mm longis, hirsutis), 8 mm longa, 5—6 mm crassa, 10-flora. *Involucrum* 5-seriatum; squamis externe sensim decrescentibus purpurascentibus, sparse glandulosis, apice obtusis, parte superiore hirsutis, margine longe brunneo-fimbrillatis; interioribus ellipticis, 3½ mm longis, 1½ mm latis exterioribus ovatis. *Flores* bisexuales. *Corolla* tubuloso-infundibuliformis, paulo minus 1 mm crassa, 5½—6½ mm longa, 5-lobata; lobis 2 mm longis, lanceolatis, subobtusis. *Antherae* ad basin

sagittatae, apice acutae. *Stylus* bifurcatus; rami pubescentes. *Achenium* turbinatum, subangulatum, plus minusve 6-costatum, paulo curvatum, glandulosum, paulo pilosum, 2 mm longum. *Pappus* uniseriatus, fulvide albus; setis pluribus, 6 mm longis, latis, ciliatis. *Receptaculum* planum, alveolatum.

Distribution in the Malay Archipelago:

B o r n e o: Upper Bosam, G. Lemabok, MOULTON 6675 (K), type specimen.

Altitude: 1200 m.

Flowers: Nov.

In the Philippines a specimen has been collected, that seems to be very closely related to this species; the involucral scales are not so long fringed, however, but shortly ciliate along the margin, and subacute, the achenes are densely glandular and glabrous: Luzon, Bontoc, VAN OVERBERGH 689 (K, L). A specimen from Busuanga Island, South of Luzon, LOPEZ 41367 (L) has leaves with narrow tips (leaves to 5½ cm broad, 16 cm long); it apparently belongs to the same species. From *Vernonia arborea* this species is to be distinguished by the 10-flowered heads. From *Vernonia patentissima* it is to be distinguished by the involucral scales, the length of the corolla and the size of the heads.

(7) **Vernonia phanerophlebia** MERRILL var. **dulitensis** nov. var. *)

Small tree. *Branches* subterete, rigid, densely leaved, densely brownish villous, 2—4 mm thick. *Leaves* numerous, shortly petiolate (petiole villous like the branches, 5—10 mm long, 1 mm thick), obovate-elliptic, obtuse or nearly so at the top, attenuate, subacute at the base; entire, dark coloured, glossy, glabrous (except the villous central nerve) above, slightly paler, shortly brownish villous beneath, very glandular at both sides (glands numerous, prominent), pinni-nerved (7—8 pairs of lateral nerves, arcuately connected at the top, prominent at both sides; extreme ones reticulated, prominent above), rigidly coriaceous; blades 3½—6 cm long, 2—2½ cm broad. *Inflorescence* terminal and at the top of the upper branches, corymbosely paniculate; branches rigid, thick, bearing 2—4 heads at the top. *Heads* oblong, 6—7-flowered, 8 mm long. *Involucrum* 5—6-seriate; scales oblong-elliptic, broadly obtuse at the top, glandular (glands prominent), villous at the superior part, glabrous and minutely glandular at the largest inferior part; long ciliate along the margin; inner scales 4 mm long. *Corolla* tubular-infundibuliform, 5-lobed, 6 mm long; lobes lanceolate, very acute at the top, 1½ mm long, having some prominent glands at the top. *Style*-branches densely pubescent, long, acute. *Anthers* distinctly sagittate at the base. *Achene*

*) The Latin description will be published in „Bulletin of miscellaneous information, Royal Botanic Gardens, Kew".

oblong-turbinate, irregularly 5-ribbed, 2½ mm long, minutely glandular, glabrous. *Pappus* uniseriate, setaceous, 5 mm long; setae fulvous, numerous. *Receptacle* small, flat; cicatrices of the flowers having a central projection.

Distribution in the Malay Archipelago:

Borneo: *Sarawak*, G. Dulit, RICHARDS 1618 (K), type specimen.

Tree 6—7 m high.

Hab.: in a moss forest.

Altitude: 1230 m.

Flowers: Sept.

This Bornean variety differs from the typical species from Luzon by the pubescence of the branches, which are glabrous in the typical species, whereas the branchlets are distinctly appressed-pubescent. The heads of the typical species are 7—8-flowered, in the Bornean variety they are 6—7-flowered.

II. Sectio **Lepidella** OLIV. et HIERN. Fl. trop. Afr. III (1877) 267; BENTH. et HOOK. Gen. Pl. II (1873—1876) 230; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 126.

Herbs or shrubs. *Leaves* petiolate or sessile, ovate, obovate, elliptic or linear, attenuate at both ends (rarely rounded at the base), acute or obtuse at the top, entire or dentate, glabrous, tomentose or pubescent beneath. *Heads* pedunculate, campanulate, 12- to many-flowered, single, paniculate or corymbose. *Involucral scales* lanceolate or oblong, obtuse or acute at the top, pilose or glabrous. *Anther*-tails short, obtuse or acute. *Achene* angular; ribs 4—10, glabrous or pilose. *Pappus* biseriate; inner row setaceous, outer row consisting of small scales.

Trop. Asia and Africa.

Key to the species.

1. a. Inflorescence pseudodichasial, elongated, diffuse. Outer involucral scales having long, spreading, crispy, brownish striate articulate hairs. Achene very densely covered with appressed long white hairs. Outer row of the pappus consisting of lanceolate, pale salmon-coloured scales . . . . . (9) **V. Junghuhniana.**

b. Inflorescence small (consisting of 5—8 heads), corymbose; branches dichotomous. Outer involucral scales whitish pilose. Achene glabrous. Outer row of the pappus consisting of very short white scales . . (8) **V. albifolia.**

(8) **Vernonia albifolia** KOSTER in Fedde Repert. XXXIV (1933) 5 — Pl. I, *b*; II, 13—14.

Herb, branched. *Stem* and *branches* terete, striate, fulvously whitish silky tomentose, 3½ mm thick. *Leaves* sessile or very shortly petiolate (petiole 2 mm long), elliptic-lanceolate or oblong-elliptic, long attenuate

and acute at both ends, entire or mucronately dentate or repandate, sparsely whitish pilose or subglabrous, dark-coloured above, densely silky white tomentose beneath, pinni-nerved (nerves prominent beneath, 6—12 pairs of lateral ones); 6—12 cm long, 1—3 cm broad. *Inflorescence* small (consisting of 5—8 heads), corymbose, terminal; branches dichotomous; upper ones ending into corymbs, much longer than the terminal corymb. *Heads* crowded, pedunculate (peduncle 1—3 mm long), about 40-flowered, cylindric, 7—8 mm long, 4—5 mm thick. *Involucre* campanulate, 5-seriate; scales whitish pilose, occasionally purplish at the top; outer ones lanceolate, sharply acuminate at the top; inner ones oblong mucronate at the top, glandular. *Flowers* exceeding the involucre, 7 mm long. *Corolla* tubular-infundibuliform, pink (when dry), 5-lobed, 5 mm long; lobes lanceolate, subacute at the top, white pilose at the superior part, 2 mm long. *Anthers* sagittate at the base, acute at the top. *Style*-branches acute at the top, hirsute. *Achene* turbinate, 4—5-angular (ribs prominent) attenuate at the base, glabrous, glandular. 1 mm long, with a thick ring at the top. *Pappus* biseriate, white; setae of the inner row caducous, 4 mm long; of the outer row paleaceous, permanent, flattened, very short. *Receptacle* slightly convex, alveolate.

Distribution in the Malay Archipelago:

Lombok: G. Rindjani, Sadjang, ELBERT 773 (L), 830 (L) — id., Sembaloen-plateau, ELBERT 1587 (L) — id., near Sembaloen river, ELBERT 1467 (L).

Hab.: in a monsoon forest, in jungles; on a clayish, more or less dry soil.
Altitude: 500—1265 m.
Flowers: April, May.

To be distinguished from *Vernonia patula* by the pilose corolla, the outer row of the pappus and the lanceolate whitish tomentose leaves.

(9) **Vernonia Junghuhniana** nov. nom.; *Vernonia Moritziana* SCH.-BIP.! in ZOLL. Syst. Verz. Ind. Arch (1854) 119, non SCH.-BIP. in Linnaea XX (1847) 511; MIQ.! Fl. Ind. Bat. II (1856) 17; BOERL. Fl. Ned. Ind. II (1899) 235; KOORDERS Exc. Fl. Java III (1912) 315 — Pl. I, *b*; II, 15.

Herbaceous, 30—110 cm high. *Roots* crowded, short, numerous. *Stem* terete or angular, ribbed, fulvously pubescent, glandular, 5 mm thick; younger *branches* greyish villous, branched at the upper part only; internodes 2½—8½ cm long. *Leaves* very variable, few, lanceolate, elliptic, ovate, spathulate-lanceolate, or elliptic-oblong, subsessile or petiolate (petiole ½—1½ cm long), long attenuate into the petiole, subobtuse and mucronate at the top (sometimes long attenuate at the top), entire or undistinctly mucronulate or repandate, appressed-pubescent,

glandular, warty above; pubescent, glandularly spotted beneath, membranous, pinni-nerved (nerves obscure, 4—10 pairs of lateral nerves), 2—10½ cm long, 2—30 mm broad. *Inflorescence* pseudodichasial, terminal and axillary, elongated, diffuse; branches thin, greyish villous, glandular; extreme ones sometimes with a small linear villous (hairs articulate) bract at the base or halfway. *Heads* on long peduncles (peduncles 5—12 mm long, thin, ½ mm thick), nearly globose, 6—8 mm wide and as long, 20—25-flowered. *Involucre* 3—4 seriate; scales very glandular; inner ones lanceolate, long acuminate and sharply acute at the top, 3-nerved, appressedly greyish pubescent, 5—6 mm long, 1 mm broad; outer ones linear, subulate at the top, villous with long spreading crispy brownish striate articulate hairs. *Flowers* not exserting the involucre. *Corolla* narrowly infundibuliform, 4½ mm long, 5-lobed; lobes short, acute, pilose at the top, less than ½ mm long; limb 2 mm long, gradually attenuate into the thin tube. *Style* pilose at the superior part; branches short, acute, pilose. *Anthers* acute at the top; shortly sagittate at the base. *Achene* oblong, attenuate at the base, obscurely 4—5-ribbed, very densely covered with appressed long white hairs, slightly glandular, 1½—2 mm long, ½ mm thick, with a callose ring at the base. *Pappus* biseriate; inner row setaceous setae ciliate, white, about 20.4 mm long; exterior row paleaceous, scales ciliate, lanceolate, flat, pale salmon-coloured or pale orange, about 20.5 mm long. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

Java: *Djokjakarta*, G. Gamping, JUNGHUHN 389 (L, U) — Djember, Noesa Baroeng, ZOLLINGER s.n. (U).

Madoera: South of Temberoe, BACKER 20486 (L) — Rapa, BACKER 20237 (B) — P. Poeteran, BACKER 20798 (B) — Balega, TEYSMANN 1739 (B) — Kemanden tanah, coll. unknown (L).

Kangean Arch.: P. Sepandjang, BACKER 28775 (B), 28747 (B) — P. Sepapan, BACKER 28463 (B) — P. Saboenten, BACKER 29648 (B) — P. Kangean, Kajoe waroe, BACKER 28110 (B) — P. Saseel, BACKER 28621 (B) — P. Bangko, BACKER 29243 (B) — P. Paliat, BACKER 29302 (B).

Timor: Portuguese Timor, Maliena, WALSH 481 (B).

Flowers pale violet (BACKER).

Vernacular name: *ai koedaroein* (Timor).

Hab.: on limestone rocks, on slopes, in grassy and deserted fields, along waysides, in jungles; locally common.

Altitude : 1—100 m, in Timor 300 mm.

Flowers: May—June.

MIQUEL, who described this species, which SCHULTZ—BIPONTINUS had named,

added to a fragment of one specimen of JUNGHUHN (H. A. R. T. 02921 A) a label on which he wrote „Vernonia Moritziana Sch.—Bip. Insula Nus. Baron, Archipel Sund., Zoll."; to other specimens of JUNGHUHN (L, U) he applied the name *Vernonia cinerea* LESS. (U) and *Vernonia cinerea* var. (L.). — From *Vernonia cinerea* this species is at once to be distinguished by the outer row of the pappus, the articulate brownish striate long hairs of the involucre, the very densely hirsute, obscurely ribbed achene and the pseudodichasial inflorescence. The name given by SCHULTZ—BIPONTINUS was a homonym. SCHULTZ—BIPONTINUS described another *Vernonia Moritziana* from Colombia in Linnaea XX (1847) 511; so the one collected on Noesa Baroeng by ZOLLINGER, named by SCHULTZ—BIPONTINUS and described by MIQUEL, ought to receive another name, as MOORE (Journ. Bot. XLIII, 1925, 54) noticed already. The name *Vernonia Junghuhniana* is proposed instead. This species was placed in the section *Tephrodes*.

III. Sectio **Tephrodes** DC. Prod. V (1836) 24; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 218; MIQ. Fl. Ind. Bat. II (1856) 11; BENTH. et HOOK. Gen. Pl. II (1873—1876) 230; CLARKE Comp. Ind. (1876) 8; OLIVER Fl. trop. Afr. III (1877) 267; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 126.

Herbs (rarely shrubs), pubescent, glandular. *Leaves* petiolate or subsessile, variable in shape, elliptic, ovate, linear, attenuate or acute or nearly rounded at the base, acute or obtuse at the top, dentate, repandate or entire, pinni-nerved, glandular, pubescent beneath. *Heads* small, campanulate, pedunculate, corymbosely paniculate few or numerous, 10—25-flowered. *Involucral scales* lanceolate, mostly very pointed, seldom mucronate at the top, pilose. *Anther*-tails short, acute (rarely obtuse). *Achene* subterete, more or less clearly ribbed, more or less appressed, most often densely pilose, glandular (rarely without glands). *Pappus* biseriate, setaceous, white; setae of the outer row short to minute.

Trop. Asia and Africa.

Key to the species.

1\. a. Outer involucral scales lanceolate, long and sharply attenuate at the top or ending into a soft prickle. Achene oblong, obscurely 5—6-angular or obscurely ribbed, pilose 2

b. Outer involucral scales nearly needle-shaped. Achene clearly ribbed (ribs prominent), white pilose between the ribs (14) **V. laxiflora.**

2\. a. Achene turbinate-cylindric, obovate-oblong, oblong, subangular, 4—6-costate or striate 3

b. Achene narrowly cylindric, attenuate at the base, terete or subterete (faintly ribbed) . . . . (10) **V. cinerea.**

3\. a. Outer setae of the pappus short, but not minute, ½—1 mm long . . 4

b. Outer setae of the pappus minute 6

4\. a. Involucrum 3—4-seriate, 4—7 mm long 5
   b. Involucrum 2—3-seriate, short, 2½ mm long . . (15) **V. subtilis.**

5\. a. Heads 6—7 mm long and as wide; peduncles nearly always naked. Corolla narrowly tubular, 5—6 mm long . . (12) **V. lanceolata.**
   b. Heads 8—10 mm long, about 7 mm wide; peduncles bearing 1—4 linear small bracts. Corolla narrowly infundibuliform, 8—9 mm long . . . (11) **V. Elmeri.**

6\. a. Leaves serrate, mucronately repandate or subentire. Heads 6—9 mm long, 4—5 mm wide. Involucral scales subobtuse and muconate, or nearly rounded, or sharply acuminate or long attenuate at the top . . 7
   b. Leaves entire or nearly so, often rhomboid-elliptic. Heads small, 5—5½ mm long, 3—4 mm wide. Involucral scales deltoid or nearly rounded, obtuse at the top . . . . (16) **V. coerulea.**

7\. a. Involucral scales subobtuse and mucronate or nearly rounded or sharply attenuate at the top. Achene narrowly oblong, obscurely 5-angular, glandular, sparsely whitish appressedly pubescent (17) **V. cymosa.**
   b. Involucral scales very long acuminate, filiform, flexible at the top. Achene turbinate, striate, without glands, densely hirsute . . . . (13) **V. Tengwallii.**

(10) **Vernonia cinerea** (L.) LESS. in Linnaea IV (1829) 291.

Erect herb, more or less branched at the upper part, 15—80 cm high. *Stem* terete, ribbed, glandular, more or less greyish pubescent, 1—2 mm thick above, 2—5 mm beneath; internodes 1½—6 cm long. *Roots* crowded, short. *Leaves* petiolate (petioles ½—3 cm long, difficulty to be separated from the blades) or subsessile, lower ones very variable; superior ones sessile, narrowly elliptic, ovate, narrowly subspathulate, lanceolate or linear; all more or less abruptly or gradually attenuate into the petiole, obtuse or acute at the top, repandate-serrate, undulate or subentire, pinni-nerved (nerves more or less prominent; lateral ones 4—5 pairs), submembranaceous or chartaceous, edges slightly recurved, dark green coloured, densely minutely warty, more or less scabrid above, greyish or pale green, glandularly black-spotted, greyish or fulvously pubescent, villous or glabrous beneath; blades of the lower leaves 3—8½ cm long, 1½—3½ cm broad, of the higher ones 1—7 cm long, 3—15 mm broad. *Panicles* terminal, compound, corymbose, 5—35 cm high, 5—15 cm wide, branches appressedly greyish pubescent, ½—1 mm thick, slender, dichotomous, ending into 2 peduncles, many of them having a minute linear bract at the base or halfway; panicles very variable in shape and size. *Heads* numerous, pedunculate (peduncles very thin, long, greyish pubescent, flexible, filiform, 2—14 mm long, having a minute linear bract halfway), subcylindrical, 6—7 mm long, 4—5 mm wide, 18—20-flowered, with 2 minute, linear bracts at the base. *Involucre* campanulate, 4-seriate, much shorter than the head, 4—5 mm long;

scales lanceolate, one-nerved, keeled, very pointed at the top, ending into a soft prickle, appressedly greyish pilose, with few shining glands, more or less pale purplish (when dry), about 30, of the inner row 4—5 mm long, less than 1 mm broad, of the outer row 1½ mm long, less than ½ mm broad. *Corolla* 4 mm long, slender, narrowly infundibuliform, 5-lobed, slightly glandular; lobes narrow, lanceolate, nearly 1 mm long, pilose at the top; tube slender, filiform. *Style*-branches short, subobtuse, pubescent; undivided part of the style pubescent above. *Anthers* clearly sagittate at the base; sterile superior part acute, nearly half as long as the anther. *Achene* narrowly cylindric, attenuate at the base, terete or subterete, faintly ribbed, appressedly whitish pubescent, densely brownish glandular, 1½—2 mm long, less than ½ mm thick, with a basal cartilagineous disc. *Pappus* biseriate, white, setaceous; setae of the inner row 4—5 mm long, silky, ciliate; of the outer row minute, ciliate, flat. *Receptacle* flat, alveolate.

Distribution: Arabia, Baluchistan, Br. India, Mal. Penins., Indo-China, S. China, Japan, Formosa, Philippines, Mal. Arch., New Guinea, Australia, Pacific Islands, Africa; introduced into S. America.

Key to the varieties.

1. a.	Heads 6—7 mm long; involucrum 4—5 mm long	2
b.	Heads small, 4—5 mm long; involucrum 2½—3½ mm long. Leaves often broadly ovate or nearly circular . . . 2. var. **parviflora.**	
2. a.	Leaves greyish or fulvously pubescent or villous beneath	3
b.	Leaves glabrous at both sides . . . . . . 5. var. **glabriuscula.**	
3. a.	Leaves densely villous beneath	4
b.	Leaves pubescent beneath	5
4. a.	Leaves mucronately serrate at the margin, densely fulvously villous beneath . . . . 6. var. **montana.**	
b.	Leaves undulate at the margin; densely greyish villous. 4. var. **lanata.**	
5. a.	Leaves linear-lanceolate or lanceolate-elliptic, edges recurved. Inflorescences small . . . . 3. var. **linifolia**	
b.	Leaves more or less elliptic or ovate, without recurved edges . . .	6
6. a.	Involucral scales very pointed at the top . . . . 1. var. **typica.**	
b.	Involucral scales obtuse at the top . . . . 7. var. **obtusa.**	

1. var. **typica**; *Conyza cinerea* L.! Sp. Pl. ed. I (1753) 862, ed. II (1763) 1208; WILLD. Sp. Pl. III (1804) 1925; BURM. Fl. ind. (1768) 179; *Vernonia cinerea* LESS. in Linnaea IV (1829) 291; LESS. in Linnaea VI (1831) 673; DC. in WIGHT Contr. (1834) 6; DC. Prod. V (1836) 24; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 219; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ. Pl. Jungh. (1854) 495; MIQ. Fl. Ind. Bat. II (1856) 11; MIQ. Sumatra (1862) 210; BENTH. Fl. Hongk. (1861) 169;

Benth. Fl. Austr. III (1866) 459; Clarke Comp. Ind. (1876) 20; Kurz in Journ. As. Soc. Beng. XLVI (1877) 200; Hook.! Fl. Br. Ind. III (1882) 233; Forbes et Hemsley in Journ. Linn. Soc. XXIII (1886—1888) 401; Clarke in Journ. Linn. Soc. Bot. XXV (1890) 35; Warburg in Engl. Bot. Jahrb. XIII (1891) 448; Trimen Fl. Ceylon III (1895) 7; Koorders in Meded. L. Pl. XIX (1898) 510; Boerl. Fl. Ned. Ind. II (1899) 235; Clarke in Bot. Tidsskr. XXIV (1902) 242; King et Gamble in Journ. As. Soc. Beng. LXXIV 2 (1905) 27; Elmer Leafl. Phil. Bot. I (1906) 94; Gleason in Bull. N. Y. Bot. Gard. IV (1906) 174; Hayata in Journ. Sci. Tokyo XXV (1908) 120; Lauterbach! in Nova Guinea VIII 2 (1910) 335; Koorders Exc. Java III (1912) 314; Ekman in Ark. Bot. XIII (1914) 95; Merrill Int. Rumph. Amb. (1917) 497; Merrill Journ. R. As. Soc. (1921) 586; Gamble Fl. Madras IV (1921) 676; Merrill Enum. Phil. Pl. III (1923) 592; Moore in Journ. Bot. LXI (1923) suppl., 27; Ridley Fl. Mal. Penins. II (1923) 188; Gagnep. in Lec. Fl. Indo-Chine III (1924) 484; Moore in Journ. Bot. LXIII (1925) suppl., 54; Heyne Nutt. Pl. Ned. Ind. II (1927) 1430; Standley in Contr. U. S. Nat. Herb. XXVII (1928) 375; Mattf. in Engl. Bot. Jahrb. LXII (1929) 401; Backer Handb. Suikerr. Java VII (1932) 751 (syn. excl.); Koster in Fedde Repert. XXXIV (1933) 2; Hochreutiner in Candollea V (1931—1934) 296; *Olus scrofinum* Rumph. Amb. VI (1750) t. 14 fig. 1; *Conyza cinerascens* Wall.! Cat. (1828) 3062 Comp. 172; *Conyza subsimplex* Wall.! Cat. (1828) 3003 Comp. 113; *Serratula cinerea* Roxb.! Fl. ind. III (1832) 406; *Vernonia prolifera* Decaisne Herb. Timor. (1835) 80 (syn. excl.); *Vernonia abbreviata* DC. Prod. V (1836) 25; Sch.-Bip. in Zoll. Syst. Verz. Ind. Arch. (1854) 119; Miq. Fl. Ind. Bat. II (1856) 12; *Vernonia leptophylla* DC. Prod. V (1836) 25; Zoll. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 220; Sch.-Bip. in Zoll. Syst. Verz. Ind. Arch. (1854) 119; Miq. Fl. Ind. Bat. II (1856) 12.

Clarke, Kurz, Hooker, King and Gamble and Gagnepain mention many more synonyms, among which *Vernonia laxiflora* Less. at least has to be lifted out.

Leaves rhomboid-elliptic (of the type specimen), rhomboid-ovate, ovate-elliptic, narrowly elliptic or ovate, greyish or fulvously pubescent (all over or only on the nerves).

Distribution in the Malay Archipelago:

S u m a t r a: *Atjeh*: P. Simaloer, Achmad 307 (L) — near Koeta-tjané, Alas-valley, Lörzing 11113 (B); *East Coast*: near Medan, Lörzing 3723 (B), 3019 (L, B), 3646 (B) — near Badjalingga, south of Tebing-tinggi, Lörzing 7545 (B) — Asahan, Bartlett and la Rue, 387 (L) —

Sibolangit, LÖRZING 3901 (B) — East of Loeboepakam, LÖRZING 3278 (B) — P. Roepat, BRUINIER 23 (B); *Tapanoeli*: Toba, OUWEHAND 42 (B) — Nias, VAN RÖMER s.n. (B); *West Coast*: G. Malintang, foot, BÜNNEMEYER 4451 (B) — Ophir-district, Soekamenanti, BÜNNEMEYER 269 (B) — G. Singalang, BÜNNEMEYER 2523 (K); *Djambi*: Koerintji, Bt. Tebakar, BÜNNEMEYER 7928 (L) — near Bangko, Merangin River, POSTHUMUS 509 (B); *Lampongs*: Negara Ratoe-estate, DE VOGEL s.n. (L) — Wai Lima, IBOET 356 (B) — near Talangbatoe, IDENBURG 37 (B) — P. Sebesie, DOCTERS VAN LEEUWEN 5393 (B). Sumatra, CUMING 2442 (K, Br. M.).

Riouw Arch.: P. Toedjoeh Ajar Soear, BÜNNEMEYER 5988 (L) — Soegi bawah, BÜNNEMEYER 7711 (L) — P. Bintan, BÜNNEMEYER 6120 (L).

Lingga Arch.: P. Lingga, BÜNNEMEYER 6771 (L), 6979 (B), 6598 (B) — P. Selajar, BÜNNEMEYER 7434 (L) — P. Singkep, BÜNNEMEYER 7103 (B) — P. Bakong, BÜNNEMEYER 7579 (B).

Bangka: South Bangka, BÜNNEMEYER 2272 (B) — Kepo Toboali, BÜNNEMEYER 2343 (B).

Java: *West Java*: G. Goentoer, KOORDERS 41703 (L), KOENS 33 (B), BACKER 5264 (B) — south of Tjibeber, Tjidadap, BAKHUIZEN VAN DEN BRINK 6386 (B) — Padjangan, Tjitarik (Priangan), BAKHUIZEN VAN DEN BRINK 3194 (B) — S.W. of Kali Poentjang (Priangan), BACKER 4493 (B) — Priangan, Zandbaai, plain behind the beach, BACKER 801 (B) — Tjiandjoer, BACKER 3082 (B) — Garoet, BURCK s.n. (B) — Plered (Batavia), BACKER 13959 (B) — near Buitenzorg, BACKER 21367 (B) — between Tjileles and Goenoengkantjana, BACKER 1200 (B) — Wanajasa (Batavia), BACKER 14348 (B) — near Sadjira (Bantam), BACKER 2073 (B) — between Penjawoengan and Bajak (Bantam), BACKER 1620 (B) — Goenoengkantjana, KOORDERS 41338 (B) — Bodjongmanik (Bantam), KOORDERS 40875 (B); *Middle Java*: on the Boroboedoer, KOORDERS 36661 (B), 36665 (B), 36728 (B) — between Doro and Bandar (Pekalongan), BACKER 15568 (B) — Madjenang (Banjoemas), BACKER 18776 (B) — Ngawen, forestry (Rembang), BEUMÉE 812 (B) — Poerworedjo, LEEFMANS 80 (B) — P. Karimondjawa, KOORDERS 40412 (B); *Djocjakarta*: Wonosari, BACKER 2596 (B) — G. Gamping, JUNGHUHN 325 (L); *Soerakarta*: Klaten, ADMIN. OF GEMAMPIR-ESTATE s.n. (B); *East Java*: G. Tengger, BUIJSMAN s.n. (U) — Bendo (Kediri), OTTOLANDER 388 (B) — Toeloengagoeng (Kediri), LÖRZING 990 (B) — between Poeger and Sabrang, BACKER 18061 (B) — Djember, BACKER 17722 (B), ULTÉE s.n. (B) — south of Bantoer, BACKER 3874 (B) — Djatiroto (Pasoeroean), BACKER 7964 (B), 8062 (B) — Saradan (Madioen), WISSE 157 (B) —

G. Lawoe, JACOBSON s.n. (B); Java, KORTHALS s.n. (L), ZOLLINGER 2704 (Br. M.), 2772 (Br. M.), det. MIQ. (U).

Kangean Arch.: P. Paliat, BACKER 29515 (B).

Saleier: WEBER s.n. (L).

Lombok: Baoen Poessok, ELBERT 2503 (L) — G. Rindjani, Laboean Tjarik, ELBERT 552 (L).

Timor: ZIPPELIUS s.n. (L).

Wetar: above Iliwaki, ELBERT 44109 (L).

Celebes: *Minahassa*: G. Sapoetan, STEUP 53 (B) — Minahassa, KOORDERS 16501 (B).

Talaud Islands: P. Karakelang, east of Beo, LAM 2589 (B).

Moluccas: *Amboina*: Mahya, BOERLAGE 228 (B) — G. Malintang near Galela, RANT 793 (B) — Waai, RANT 624 (B) — *Boeroe*: Fakel, TOXOPEUS 525 (B).

Aroe Islands (ex WARBURG).

Borneo: *W. Borneo*: Karimata besar, MONDI 198 (L, B); *S.E. Borneo*: Banjermasin, KORTHALS s.n. (L) — Tikoeng, AMDJAH 780 (U); *Sarawak*: upper Rejang River, CLEMENS 21433 (B) — Rejang, Siboe, HAVILAND 3608 (K); Borneo, RIDLEY 12362 (K), GRABOWSKY s.n. (Br. M.).

Flowers purplish or bluish violet (KJELLBERG a.o.), white (LAM); tube of the corolla white, lobes violet or pink (BACKER l.c.). Involucral scales brown, recurved (id.). Pappus-hairs of the inner row dropping afterwards (id.). Herb up to 160 cm high (id.).

Vernacular names: *ti margalonggoeng, taroe taroe, tenoe hoeloengoe, pidak bangkong, moenerie koendiembie, rante piti, tjapeu toehoer, marènè, ning tjimng, semboeng (kebo)* (all Java), *ambong ambong, djalantir* (all Sumatra), *roempoet soesoeap* (Bangka), *gofoe montiara* (Ternate), *tempoeloet babie* (Borneo), *roempoet tai babie* (Karimata Arch.).

Hab.: along waysides, in grassy fields, in a dry rice field, in teak, Eucalyptus and monsoon forests; on a dry open sandy soil, on stony lava slopes, on the beach, in rubber and tea plantations (BACKER l.c.), on dunes (BACKER l.c.), on weathered lime, on rather dry volcanic tuff; common, except in the Kangean Arch.

Altitude: 0—1000 m.

Flowers during the whole year.

Use: Bruised leaves against injuries; leaves against eye troubles and as a febrifuge. Root against cough (HEYNE l.c.).

Distribution: Trop. Asia: Arabia!, Baluchistan!, Bombay!, Punjab!, Madras!, Ceylon! (leaves nearly quite glabrous), Himalaya! (up to 1500 m), Garhwal! (leaves very pubescent, crispy pubescent above, leaves crowded), Behar!, Bengal!, Sikkim!, Assam!, Delhi!, Burma!, Andaman Islands!, Siam!, Annam!, Cambodge!, Cochin-china!, Laos, Tonking!, Mal. Penins.!, China (Hainan), Japan, Formosa, Philippines (Luzon!, Mindanao!), New Guinea! (Merauke, KOCH: leaves very long and narrow, lanceolate, upper ones to 8 cm long, ½ cm broad); Polynesia: Solomon Islands!, Carolines!, Cape Verde Islands!; New Caledonia!, Australia!; Africa!, Madagascar,

Mauritius. Introduced into South America! (Surinam!, West Indies!). BAKER (Fl. Bras. VI 2, 1873—1876) does not mention this *Vernonia*, so it must have been introduced into S. America in the latest sixty years.

The specimens of Amboina, collected by RANT, have many heads of which the involucre contains, instead of flowers, peduncles bearing several rows of pilose linear bracts. MIQUEL added to the specimen from Djokjakarta (JUNGHUHN 325) a label on which he wrote „var. minor Miq." but he did not publish this variety in his Fl. Ind. Bat. I cannot find a reason to separate this specimen from the other ones of *Vernonia cinerea* (L.) LESS.

2. var. **parviflora** (BL.) DC. Prod. V (1836) 24; ZOLL.! in Nat. Gen. Arch. Neêrl. Ind. II (1845) 219; HASSK. Pl. jav. rar. (1848) 527; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; FORBES Mal. Arch. (1886) 216; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 484; *Vernonia parviflora*, REINW. in BL.! Bijdr. (1825) 893; MIQ.! Fl. Ind. Bat. II (1856) 11; MIQ. Sumatra (1862) 210; *Vernonia cinerea* LESS., Ed. HOHENACKER (1847) 3 Ind. Or, Terr. Canara! (var. *angustifolia* SCH.-BIP. incl.).

Herb. 12½—20 cm or higher. Lower *leaves* elliptic-ovate or broadly ovate to nearly circular, sparingly pubescent beneath. *Heads* small, 4—5 mm long. *Involucre* 2½—3½ mm long. *Corolla* 2½—3 mm long. *Achene* 1—1½ mm long.

Distribution in the Malay Archipelago:

Sumatra: *East Coast*: Serdang, LÖRZING 3415 (B) — id. near Pantaitjermin, LÖRZING 9254 (B) — Upper Bila-plain, Aekboero, LÖRZING 9632 (B); *West Coast*: Padang, HALLIER C 194 (L), BOERLAGE s.n. (L), coll. unknown (B); *Palembang*: Palembang, DE VOOGD 404 (B); *Lampongs*: Telokbetong, BACKER 31601 (B).

Bangka: Pankalpinang, VAN DER VECHT 15 (B) — Moentok, BÜNNEMEYER 1422 (L).

Riouw Arch.: P. Bintan, BÜNNEMEYER 6246 (B).

Lingga Arch.: P. Senajan, BÜNNEMEYER 7467 (L) — P. Lingga, BÜNNEMEYER 6650 (B) — P. Sinkep, BÜNNEMEYER 7174 (B).

Krakatau: Zwarte Hoek, DOCTERS VAN LEEUWEN s.n. (B) — Lang Eiland, DOCTERS VAN LEEUWEN s.n. (B) — Krakatau, BOERLAGE s.n. (B).

Java: *West Java*: Bantam, FORBES 49 (Br. M.) — Pandeglang, BACKER 7502 (B) — Java's eerste punt, BACKER 21338 (B) — Goenoeng-kantjana, KOORDERS 41146 (B) — Batavia, coll. unknown (K), REINWARDT s.n. (L), VORDERMAN s.n. (B), PIEPERS s.n. (B), VAN DER VEEN s.n. (L) — Weltevreden, Koningsplein, KOORDERS 32660 (B), JUNGHUHN 364 (L), 329 (L), BACKER 21368 (B) — Buitenzorg, KOORDERS 32614 (B), BOERLAGE s.n. (L), HALLIER 156 (L), BAKHUIZEN VAN DEN BRINK 1629 (B), R. J.

BAKHUIZEN VAN DEN BRINK 46 (B), 3815 (B), BURCK and DE MONCHY s.n. (B), SOEGANDIREDJA s.n. (B), HALLIER 156a (B, L), RAAP 25 (L) — east of Poerwakarta, HARMSEN 10 (B) — Depok, KOORDERS 40508 (B) — Tjampea, KOORDERS 31464 (B) — Krawang, BEUMÉE 4575 (B) — south of Djasinga, BACKER 10048 (B) — P. Dapoer, VAN STEENIS 4478 (B) — P. Alkmaar, MOUSSET 527a (B) — P. Edam, BACKER 21337 (B), 31019 (B), BOSCHMA 14 (B) — Thousand Islands, P. Noordwachter, BOSCHMA 78 (B), BACKER and VAN SLOOTEN 35084 (B) — Bandoeng, BACKER 12129 (B) — Lampegan, G. Rosa (Priangan), LEEFMANS s.n. (B) — Sindanglaja (Priangan), VALETON s.n. (B) — Tjiratjap (Priangan), BACKER 17408 (B) — Banjar (Priangan), BACKER 21343 (B) — Indramajoe, BACKER 16702 (B) —Karang ampel (Cheribon), BACKER 16814 (B) — Tjikoja, Batavia, ZOLLINGER 24 (L, K); *Middle Java*: Tegal, WINCKEL s.n. (L), 616 (B), BEUMÉE 3697 (B) — Keboemen, BRINKMAN 8 (B) — Madjenang, BACKER 18563 (B) — between Slawi and Balapoelang, BACKER 15385 (B) — Brebes, BACKER 15442 (B) — Maos, Poerwokerto, BACKER 11 (B) — Soeboh (Pekalongan), BEUMÉE 3781 (B) — Pekalongan, BEUMÉE 192 (B) — near Tjilatjap, WOLFF VON WÜLFING W 38 (B) — Karanganjar, KOORDERS 26218 (B, L) — Salatiga, BACKER 30115 (B) — Kendal, BACKER 16316 (B) — res. Semarang, BEUMÉE 1164 (B), DOCTERS VAN LEEUWEN-REYNVAAN s.n. (U) — Ambarawa, BACKER 30347 (B) — Ngarengan (Semarang), BEUMÉE 5018 (B) — P. Karimondjawa, KARTA 223 (L, B) — Kedoengdjati, KOORDERS 25000 (B); *Soerakarta*: Soerakarta, HEMKEN s.n. (B) — Klaten, ADMIN. OF GEMAMPIR 2 (B), 58 (B); *East Java*: Morokremban, navy aerodrome, VAN SLOOTEN 2015 (B) — Probolinggo, BACKER 24376 (B) — Madioen, BACKER 6987 (B) — Djember, UITTÉE 13 (B); Java: ZOLLINGER s.n. (L), HORSFIELD 16 (K), 17 (K), s.n. (U), COOK s.n. (Br. M.).

Kangean Arch.: P. Kangean: Ardjasa, BACKER 26868 (B) — south of Tambajagan, BACKER 27499 (B) — Kali Sangka, BACKER 29993 (B) — P. Saoebi, BACKER 28402 (B), MAHLMEISTER 19 (B) — P. Sepapan, BACKER 28462 (B).

Madoera: Sampang, BACKER 19710 (B) — between Bangkalan and Arosbaja, BACKER 19277 (B).

Lombok: WALLACE s.n. (K).

Soemba: TEYSMANN 8822 (B).

Timorlaoet (Tanimbar Islands): FORBES 3357 (Br. M.).

Borneo: *S.E. Borneo*, Banjermassin, MOTLEY 291 (B), KORTHALS (L); *Br. N. Borneo*, CREAGH s.n. (Br. M.); Borneo, HAVILAND 3024 (K, L), KORTHALS s.n. (L), Seriboe, GRESHOFF s.n. (B).

Celebes: *Minahassa*, KOORDERS 16494 (L) — Bonto Parang (S.W. Celebes), BÜNNEMEYER 10570 (B) — Gorontalo, Adj. Veearts 5a (B), RIEDEL s.n. (K) — Moeara Sampara, KJELLBERG 1320 (B).

Moluccas: *Banda*, coll. unknown (L), G. Api, TREUB s.n. (B) — *Ceram*: Atiahoe, KORNASSI 791 (B, U, L), Ceram, FORSTEN s.n. (L) — *Amboina*: ROBINSON 426 (K, L) — *Ternate*: BEGUIN 821 (B).

Kai Islands: P. Elat, JENSEN 175 (B) — P. Toeal, JENSEN 350 (B, L).

Though most specimens are rather easy to be distinguished, there are many other ones, which may belong to *Vernonia cinerea* var. *typica* as well. In both varieties the leaves are very variable.

Vernacular names: *samboeng lalaki, eran eran, koeripan, boejoeng boejoeng, tepakliman, gletang* (all Java).

Hab: along waysides, in grassy fields, in teak forests, in a dry rice field, in gardens and fields close to the sea, on the beach; few to fairly many.

Altitude: 0—1200 m.

Flowers during the whole year.

Distribution: Trop. Asia: Br. India (Ceylon!, Laccadive Islands!, Mangalor!, Madras!, Selangor!), Siam! Indo-China!, Philippines (Luzon!), New Guinea!, Bismarck Arch.! Polynesia: Marianne Islands!, Fiji Islands!, Tuamotos Islands! Hawaian Islands!, Keeling Islands.

A specimen from Banda, TREUB s.n. (B), is a monstrous form: its heads consist of a poorly developed involucrum, which contains long stalked, reduced heads, consisting of small, lanceolate, pilose bracts surrounding some reduced flowers.

3. var. **linifolia** (BL.) nov. comb.; *Vernonia linifolia* BL. Bijdr. (1825) 893; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 220; MIQ. Fl. Ind. Bat. II (1856) 13.

Stem and *branches* more or less elongated. *Leaves* sessile, linear-lanceolate or lanceolate-elliptic, entire or mucronulate at the edges, scabrous above, fulvously sparsely pubescent beneath, coriaceous; edges recurved; nerves prominent beneath; blades 1½—7 cm long, 3—10 mm broad. *Inflorescence* small, diffuse. *Corolla* elongated, 5—6 mm long.

BLUME's type specimen is not to be found in the Leiden Herbarium (as MIQUEL stated already), but there is a *Vernonia*, to which a label is added, on which is written by BLUME „Vernonia linifolia mihi 1992"; there is no indication, where the plant has been collected. BOERLAGE has written on another label, added to this *Vernonia* „Vernonia cinerea DC var. angustifolia Sch.-Bip.". Instead of *Vernonia linifolia* BLUME this plant seems to be the upper part of a specimen of *Vernonia cinerea* LESS. BLUME's label probably belonged to another specimen. The leaves of *Vernonia cinerea* are very variable and there are intermediate forms to the leaves of *Vernonia linifolia*, the length of the corolla of *Vernonia cinerea* is not constant; so it seems preferable to put this species to the varieties of *Vernonia cinerea* LESS.

Distribution in the Malay Archipelago:

Sumatra: *East Coast*: Karo-plateau, LÖRZING 6237 (L), 8571 (B) — id., near Raja, LÖRZING 4872 (B) — id., Brastagi, RIDLEY s.n. (K); *Tapanoeli*: Habisaran-plateau, LÖRZING 6491 (L) — N.W. of the lake of Toba, LÖRZING 9332 (B), 7230 (B) — Parsoboeran (Habinsaran), LÖRZING 7785 (B).

Java: *West Java*: Tjibeber, Priangan, BAKHUIZEN VAN DEN BRINK 6895 (L), 75a (L), 3721 (B) — Tjitjoeroeg, Priangan, BACKER 17215 (B) — north of Tjiandjoer, Priangan, BACKER 23556 (B) — Tjiogrek, s.e. of Buitenzorg, coll. unknown (B) — near Takoka, Priangan, KOORDERS 15245 (B) — Buitenzorg, HALLIER s.n. (B); *East Java*: Sempol, near Sitoebondo, KOORDERS 20836 (B) — Idjen, KOORDERS 19881 (B).

Celebes: *S.W. Celebes*: Lombasang, BÜNNEMEYER 11640 (B), 11359 (B), 10957 (B) — G. Bonthain, BÜNNEMEYER 11256 (B) — Kendari, KJELLBERG 454a (B) — G. Galesang, near Malmo, BÜNNEMEYER 10814 (B) — Tanette, BÜNNEMEYER 12518 (B) — Malakadji, BOUMAN-HOUTMAN 69 (B) — Malino, POSTHUMUS 3456 (B).

Flowers red (HALLIER).

Hab.: along waysides, along the edges of a forest, in grassy fields; few or many together; fairly common.

Altitude: 100—1500 m.

Flowers: Jan.—June, Nov.

Distribution: Burma!

Some specimens from Celebes (POSTHUMUS 3456, B) are small herbs, 12—20 cm high and very much branched at the base.

4. var. **lanata** nov. var.; *Vernonia salvaefolia* ZIPPELIUS 244 (L).

Folia oblongo-elliptica (superiora lanceolata), margine undulata, subtus dense incane villosa, apice obtusa vel subrotundata, mucronata. *Inflorescentia* ramosa; ramuli et pedicelli graciles.

Distribution in the Malay Archipelago:

Moluccas: *Amboina*: ZIPPELIUS 244 (L), type specimen — G. Malintang, near Galela, RANT 791 (B); *Boeroe*: Kajeli, BINNENDIJK s.n. (B).

This variety has been noticed by BENTHAM (Fl. Austr. III, 1866, 460) already, but not named, nor described. It cannot be named *V. cinerea* (L) LESS. var. *salviaefolia* on account of *Vernonia salvifolia* (WIGHT in CLARKE Comp. Ind. (1876) 20).

Distribution: Australia!, New Caledonia!

In Amboina a monstrous form has been collected, RANT 791 (B), with long pedunculate heads (peduncles sometimes with numerous minute linear bracts), of which the involucre surrounds fairly long peduncles, bearing many rows of very small lanceolate, pointed bracts at the top.

5. var. **glabriuscula** DC Prod. V (1836) 24; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 219; *Vernonia sinulata* MIQ. in Fl. Ind. Bat. II (1856) 18; BOERL. Fl. Ned. Ind. II (1899) 235; KOORDERS Exc. Fl. Java III (1912) 316.

Stem quite glabrous. *Leaves* large, thin, obovate-rhomboid (upper ones elliptic-lanceolate), obtuse at the top, suddenly attenuate at the base, afterwards gradually attenuate into the petiole, quite glabrous at both sides, glandular beneath, undulate at the edges; blades 8—9 cm long, 3½—4½ cm broad; upper ones ½—2 cm broad, 5—7½ cm long; petioles 3—3½ cm long.

Distribution in the Malay Archipelago:

Java: *West Java*: Tjikoja, Batavia, ZOLL. et MOR. 215 (ex. ZOLL. l. c.); *Soerakarta*: HORSFIELD s.n. (U); Java: HORSFIELD 18 (K).

In the Br. Mus. another specimen of *Vernonia sinulata* MIQ. is to be found without a label. Though in the type specimen the leaves are elliptic-rhomboid, DE CANDOLLE's variety and MIQUEL's species are not very much different.

Distribution: Br. India (Madras ex MIQ. l.c.).

6. var. **montana** CLARKE Comp. Ind. (1876) 21.

Branches fulvously villous; hairs appressed, crisped, mixed with brownish striate short, erect ones. *Leaves* subsessile or shortly petiolate, small, elliptic, sharply mucronately serrate, recurved at the margin, coriaceous, scabrid and villous above, densely fulvously villous, glandular beneath; blades 1½—2½ cm long, ½—2 cm broad. *Heads* numerous, 8 mm long, about 15-flowered. *Involucral scales* very long pointed at the top, recurved at the top. *Pappus* fulvous.

Distribution in the Malay Archipelago:

Sumatra: *Atjeh*: Gajo and Alas-districts, WIND 9831 (B), id., G. Api, exped. VAN DAALEN 288 (L, B); *East Coast*: Brastagi, BEUMÉE 808 (B); *Tapanoeli*: Toba, RUTTNER 45 (B) — north of the lake of Toba, LÖRZING 9782 (B).

Flowers violet (WIND, BEUMÉE).

Hab.: in grassy fields, on a swampy soil, on a rocky slope; locally common, scattered.

Altitude: about 1400 m.

Flowers: April, May, Aug., Dec.

Distribution : Khasia (ex Clarke l.c.).

Though I did not see the type specimen of this variety, it is very probable, according to CLARKE's description (however short it may be), that the Sumatran mountain forms, described above, belong to the same variety.

7. var. **obtusa** nov. var.

Folia rhomboideo-elliptica, parce pubescentia. *Capitula* parva, 5 mm longa; *squamis involucri* apice obtusis.

Distribution in the Malay Archipelago:

Timor: Soë (South Central Timor), Walsh 38 (B), type specimen.

Flowers pale violet (Walsh).

Hab.: along waysides, on marly soils; numerous.

Altitude: 880 m.

Flowers: Jan.

Differs from *Vernonia physalifolia* DC. var. *glabrescens* DC. (Prod. V, 1836, 24) in the shape of the leaves.

Vernonia borneensis Miq.! (Fl. Ind. Bat. II, 1856, 16; Boerl. Fl. Ned. Ind. II, 1899, 235; Merrill in Journ. R. As. Soc., 1921, 586) is, just as Merrill supposes, merely a form of *Vernonia cinerea* (L.) Less., where some inferior leaves are more deeply incised, which makes the leaves coarsely serrate to lobulate instead of repanded-serrate.

We find these leaves not only in Bornean specimens, Borneo, S. Pary, Jaheri 1144 (B), N. Borneo, Pladjoe, Amdjah (19 (L), Borneo, Korthals?, det. Miquel (L), but also in those from Java, Bantam, Bodjongmanik, G. Liman, Koorders 40875 (B) and from Sumatra, Lampongs, 200 m, Iboet 356 (L).

Hasskarl (Pl. jav. rar., 1848, 526) mentioned a herb, identifying it as *Vernonia cinerea* (L.) Less. var. *rotundifolia* Wight, which is very common near Batavia. The leaves were described as being much larger than those of *Vernonia cinerea* (L.) Less.: 7½—12 cm long, 3—6 cm broad. The achene is quandrangular, with sharp angles, the pappus is uniseriate. It cannot belong to *Vernonia cinerea* (L.) Less. on account of these characteristics; it may be not even a *Vernonia* at all.

(11) **Vernonia Elmeri** Merrill! in Phil. Journ. Sci. V (1910) 252; Merrill Enum. Phil. III (1923) 593; *Gynura angulosa* Elmer (non DC.) ex Merrill; Elmer Leafl. Phil. Bot. I (1906) 146 (syn. excl.); *Vernonia lanceolata*, Koster in Fedde Repert. XXXIV (1933) 3, non Mattf. — Pl. I, *c*.

Herbaceous, scandent; *stem* terete, clearly and much ribbed, glandular, pubescent (hairs greyish, appressed), 4 mm thick; internodes 2—6 cm long. *Leaves* shortly petiolate (petiole 2—7 mm long) chartaceous or submembranaceous, elliptic, elliptic-ovate or elliptic-oblong, more or less long acuminate and acute or obtuse and mucronate at the top, shortly acute or nearly rounded at the base, distantly and mucronately dentate all over or at the upper part only and entire at the lower part, or quite entire, pinni-nerved (nerves not much prominent; lateral ones 4—5 pairs; extreme ones reticulate), glandularly spotted, sparingly appressedly fulvously pubescent (most pubescent on the nerves) beneath, subglabrous or very shortly and distantly pubescent above; blades 6—8½ cm long, 2—5 cm broad; upper ones smaller and more narrow, to elliptic-lanceolate, 4—6 cm long, 1—2 cm broad. *Inflorescence* corymbosely paniculate, terminal; branches with a small leaf or a linear bract at the base. *Heads* pedunculate (peduncles 8—25 mm long, filiform, flexible,

½ mm thick, pubescent, bearing 1—4 linear small bracts), campanulate, about 20-flowered, 8—10 mm long, about 7 mm wide. *Involucre* campanulate, 4-seriate; scales very glandular, more or less pubescent; of the inner row lanceolate, 3-nerved (central nerve prominent), 6—7 mm long, very sharply and long acuminate, subulate at the top; of the outer rows linear, subulate at the top, uni-nerved. *Corolla* narrowly infundibuliform, more or less glandular, 8—9 mm long, long exserting the pappus, 5-lobed; lobes subacute at the top, 2 mm long, pubescent at the top, ½ mm wide. *Style*-branches filiform, pubescent, exserting the corolla. *Anthers* elongated, shortly sagittate at the base, subacute at the top. *Achene* oblong, sub-angular, afterwards subterete, obscurely ribbed (ribs 8), hirsute (hairs spreading), densely glandular. *Pappus* setaceous, biseriate, white, inner row 5 mm long; outer row 1 mm long. *Receptacle* flat, alveolate, naked.

Distribution in the Malay Archipelago:

Celebes: *Manado*: Manado, KOORDERS 16509 (L), 16510 (L), 16469 (L) — Minahassa, Ratahan, LAM 2420 (B) — Tondano, FORBES s.n. (L), KRUYFF 64 (B) — G. Klabat, KOORDERS 16503 (B), 16496 (B) — near Kajoewatoe, KOORDERS 16525 (B) — G. Lokon, summit, KOORDERS 16499 (B) — Tawas rintok, way to Taniki-diata, DE LA SAVINIERRE 153 (K); *S.W. Celebes*: near Lombasang, BÜNNEMEYER 11496 (L) — G. Bonthain, BÜNNEMEYER 12401 (B) — Malino, near Makassar, BÜNNEMEYER 10723 (B), RANT 476 (B) — Kalibankere, TEYSMANN 12589 (B); *S.E. Celebes*: Mengkoka, Baoela, ELBERT 3211 (L); Celebes, Sassak, RACHMAD 956 (B); *P. Boeton*: Kaboengka, KJELLBERG 235 (B).

Flowers violet (KJELLBERG a.o.), blue (BÜNNEMEYER), white (LAM); almost a shrub, 2½ m high (LAM).

Vernacular name: *lawet rinteh* (Celebes).

This *Vernonia* is to be distinguished from the next species, to which it is closely related, by the much larger heads, the flexible filiform peduncles bearing 1—4 linear bracts, the smaller and thinner inflorescence and the much longer infundibuliform corolla. From *Vernonia cinerea* (L.) LESS. it is different by the ribbed achene, the scandent habit, the large heads and the shape of the corolla. To 3 m high (ex MATTFELD).

Hab.: in primeval and other forests, in jungles, in and along hedges, along waysides; on volcanic tuff and sand, on clay, on a swampy as well as on a rocky soil; not very common.

Altitude: 50—2000 m.

Flowers: Jan.—Oct.

Distribution: Philippines (Luzon!, Palawan!, Mindanao!), Soeloe Archipelago!

(12) **Vernonia lanceolata** (WARBG.) MATTF.! in Engl. Bot. Jahrb. LXII (1929) 401, 494; id. in Nova Guinea XIV (1928) 517, non

KOSTER in Fedde Repert. XXXIV (1933) 3; *Blumea lanceolata* WARBURG (ex MATTF. l.c.) in Engl. Bot. Jahrb. XIII (1891) 446; LAUTERBACH in Nova Guinea VIII 4 (1912) 864; BOERL. Fl. Ned. Ind. II (1899) 239 — Pl. I, *c*; III, 27—28.

Herbaceous, often scandent (ex MATTF. l.c.); *stem* subterete, ribbed, fulvously appressed-pubescent, (lower part glabrous), glandular, 4—7 mm thick; internodes 2—6½ cm long. *Leaves* petiolate (petioles 6—15 mm long, of the upper leaves short, 2 mm long), elliptic or elliptic-ovate, attenuate (sometimes shortly at the base) and acute at both ends (sometimes acuminate at the top), entire or mucronulate at the edges, submembranous, fulvously sparingly pubescent at both sides (most pubescent on the principal nerve beneath) pale coloured, glandularly black-spotted beneath, warty above, pinni-nerved (lateral nerves 4—6 pairs, not very prominent, extreme nerves reticulate); blades 6—14½ cm long, 2—5½ cm broad; upper leaves smaller and more narrow, to lanceolate-elliptic, 2½ cm long, 1 cm broad. *Heads* numerous, in terminal ample corymbose panicles, to 18—25 cm wide; branches of the inflorescence gradually thinner to the top, bare except the small branched superior part, ribbed, cinnamomeously tomentose; leafless at the base except the 1—3 lowest branches, having one small leaf at the base or halfway. Heads pedunculate (peduncles rigid, ribbed, cinnamomeously tomentose, 1—1½ cm long, ½ mm thick, without bracts or rarely having one small linear bract), about 25-flowered, 6—7 mm long and as wide. *Involucre* campanulate, 3—4 seriate, 4—5 mm long; scales linear, long and sharply acuminate, of the inner row 3-nerved, (midrib prominent), outer ones 1-nerved, all glandular, shortly pubescent. *Flowers* not much exserting the pappus. *Corolla* narrowly tubular (nearly filiform), sparingly pubescent or subglabrous, 5-lobed, 5—6 mm long; lobes linear, sparingly pubescent at the top, 1—1½ mm long. *Style*-branches filiform, pubescent, not much exserting the corolla. *Anthers* acute at the top. *Achene* oblong, more or less angular, obscurely ribbed (ribs 5—8), shortly pubescent (hairs spreading), glandular, 2 mm long. *Pappus* biseriate, setaceous, dirty whitish; inner row 4—5 mm long, outer row 1 mm long. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

Talaud Islands: *P. Karakelang*, east of Beo, LAM 2630 (B).

Moluccas: *Boeroe*: Nal'Besi, TOXOPEUS 190 (L); *Amboina*: Soja, TREUB s.n. (B), Amboina, ROBINSON 1834 (L, K); *Ceram*: Amahey, TREUB s.n. (B) — W. Ceram, north of Melila, RUTTEN 1638 (L) — W. Ceram, near Wai Nalo, RUTTEN 1584 (B) — Roho, KORNASSI 479 (B)

— N. Ceram, near the River Toeloearang, KORNASSI 88 (B) — N. Central Ceram, Wai Moela, RUTTEN 128 (B); *Halmahera*, P. Tidore, G. Mala Mala, LAM 3709 (B).

Flowers blue (RUTTEN, KORNASSI), pale violet (TOXOPEUS), bluish violet (RUTTEN), violet (RUTTEN). Herb or nearly shrub 1—2½ m high, (ex MATTF. l.c.).

Vernacular name: *dina kape* (Moluccas), *gorang gelaba* (Tidore).

Hab.: in primeval forests, along waysides, in an alang alang field, on river-banks, as a weed in gardens; on a stony soil, in a sunny place.

Altitude: 30—1000 m.

Flowers: April—Nov.

Distribution: New Guinea!, Bismarck Archipelago (New Ireland!).

To be distinguished from *Vernonia cinerea* (L.) LESS. by the shape of the leaves (which are often large), the ribbed achene and the scandent habit. Much allied to *Vernonia Elmeri* MERRILL, which MATTFELD placed to the synonyms of *Vernonia lanceolata* (WARBURG) MATTF., but it has much smaller heads; the branches of the inflorescences and the peduncles are nearly always naked, shape and size of the corolla is different, the peduncles are rather thick and rigid, the leaves are larger.

Two specimens from Ceram, TREUB s.n. (B), are monstrous forms with heads, which possess stalked flowers. The hirsute, fairly thick peduncles of the flowers pass into the achenes, which are glandular like in normal flowers, but reduced. Corolla incised to the base, anthers not connate, pappus much shorter than usual, peduncles of the heads often bearing one or two bracts.

(13) **Vernonia Tengwallii** nov. spec. — Pl. II, 20.

Herbacea, flexuosa, elongata, foliosa. *Caulis* subteres, striatus (costis densis), glandulosus, ferrugineo-pubescens (pilis appressis), 2—3 mm crassus; in axillis foliorum rami breves vel longiores, folia minora ferentes, internodiis 2—3 cm longis. *Folia* alterna, sessilia vel sub-petiolata, lanceolata, basi sensim angustata, apice longissime attenuata, acuta, margine repande mucronata (mucronulis tenuibus) vel subintegra, pinninervia (nervis lateralibus circiter 14, subtus prominentibus, omnibus breviter pubescentibus, reticulatione obscura); supra scabra, subtus sub-glabra (nervis exceptis) subtus minutissime nigro-punctata, membranacea; 7—15 mm lata, 7—12 cm longa; superiora paulo minora. *Inflorescentia* terminalis, corymboso-paniculata, laxa, foliosa, ramis tenuibus, dense ferrugineo-pubescentibus (pilis appressis), in axillis foliorum minorum, ramulis extremis pedunculos duos ferentibus. *Capitula* longe pedunculata, pedunculis tenuibus 1—2 cm longis, flexuosis, ferrugineo-pubescentibus, (pilis appressis), nudis vel bractaea parva filiformi medio vel basi prae-ditis, homogama, campanulata, circiter 15-flora, 8—9 mm longa, 4—5 mm crassa. *Involucrum* 4-seriatum, campanulatum, 7—8 mm longum, squamis sensim decrescentibus, lanceolatis, apice longissime attenuatis, filiformi-bus, flexuosis, ½ mm latis; interioribus scabride pubescentibus (pilis

brevissimis, albidis); exterioribus sparse tomentosis (pilis longis, purpureo-striatis). *Flores* bisexuales, involucrum paulo superantes. *Corolla* infundibuliformis, sparse glandulosa, 5-lobata, 6 mm longa, lobis lanceolatis, longis, apice acutis, parce pilosis, dense glandulosis, 2½ mm longis. *Stylus* bifurcatus; rami acuti, pilosi, crassi, corollam paulo superantes. *Antherae* ad basin breviter sagittatae, apice acuminatae, acutissimae. *Achenium* turbinatum, striatum (costis 8—10), eglandulosum, dense hirsutum, 1½ mm longum. *Pappus* biseriatus, setaceus; setis interioribus caducis, ciliatis, 4½ mm longis; setis exterioribus applanatis, ciliatis, minutis. *Receptaculum* parvum, planum, alveolatum.

Distribution in the Malay Archipelago:

Lombok: G. Rindjani, TENGWALL 33 (L), type specimen, (B, K).

Altitude: 2000—3000 m.

Flowers: Oct.

This *Vernonia* is to be distinguished from the allied species *V. lanceolata* and *V. Elmeri* by the very long attenuate, flexible involucral scales, the achene without glands and the leafy inflorescence. From *Vernonia Teysmanniana* it is to be distinguished by the ribbed achene.

(14) **Vernonia laxiflora** LESS. in Linnaea VI (1831) 646; DC. Prod. V (1836) 25; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 221; MIQ. Fl. Ind. Bat. II (1856) 14; KOSTER in Fedde Repert. XXXIV (1933) 2 — Pl. I, *d*; II, 17—19.

Herbaceous more or less branched, 25—80 cm high; *roots* short, numerous; *stem* and *branches* thinly pubescent (hairs fairly long), terete, ribbed (ribs prominent), glandular; branches dichotomous; internodes 2—7 cm long. *Leaves* petiolate (petioles 1—4 cm long), elliptic, broadly elliptic-ovate, nearly round or rhomboid-elliptic, gradually attenuate to the top, abruptly attenuate at the base, continued by a narrow part along the petiole, acute at the top, serrate (teeth and top sharply mucronate) or subentire, sparsely hirsute, scabrid above, glandular, pubescent beneath, membranous, pinni-nerved (lateral nerves 4—5 pairs), blades 1—6½ cm long, 1½—3 cm broad; upper leaves subsessile, narrowly rhomboid-elliptic or lanceolate-elliptic; blades 1—4 cm long, ½—1 cm broad. *Inflorescence* small, leafy, loosely paniculate; heads 3—8 together at the top of the extreme ramifications, forming small corymbose panicles in the axils of the upper leaves; lower branches of the inflorescence often longer than the superior ones. *Heads* pedunculate (peduncles slender, pubescent, ½—1 cm long, having a linear bract halfway), narrowly campanulate, 10—20-flowered, 6 mm long, 4½—5 mm thick. *Involucre* campanulate, 4-seriate, as long as the flowers, 6 mm long; scales slightly pubescent, glandular; of the inner row lanceolate, 3-nerved,

ending into a soft prickle at the top, of the outer rows very narrow, nearly needle-shaped, gradually widened at the base, 1-nerved, spreading. *Corolla* infundibuliform, 5-lobed, 4 mm long; lobes long, subacute, nearly as long as the limb, pilose, with some shining glands, tube slender. *Anthers* shortly sagittate at the base, subacute at the top. *Style* pilose at the upper part; branches long, subobtuse, pilose. *Achene* oblong-obovate, ribbed (ribs 6—8, prominent), white-pilose between the ribs, minutely glandular, 1—1½ mm long, less than ½ mm to ½ mm thick. *Pappus* white, biseriate, setaceous; inner row caducous, 3½ mm long, outer row ½ mm long, all ciliate. *Receptacle* flat, slightly alveolate.

Distribution in the Malay Archipelago:

B a l i: Boeleleng, ROBINSON 2526 (L) — Singaradja, VERMEULEN 5 (B).

L o m b o k: G. Rindjani, Laboean Tjarik, ELBERT 608 (L) — id. Pringabaja, ELBERT 2071 (L) — id., Sadjang, ELBERT 748 (L) — id., Bajan, ELBERT 688 (L).

T i m o r: FORBES 4059 (L, K), 3816 (B).

Hab.: in monsoon forests, near a river, in jungles; on a more or less dry soil, on sand or clay, in a sunny place; frequent.

Altitude: 20—700 m.

Flowers: April, June.

Vernonia laxiflora is recorded from Malacca by DE CANDOLLE; RIDLEY (Fl. Mal. Penins. II) does not mention it from the Peninsula; KING and GAMBLE (in Journ. As. Soc. Beng. LXXIV 2, 1905, 27) consider it as a synonym of *Vernonia cinerea*.

This *Vernonia*, having a clearly ribbed achene, is not quite in the right place in the sectio *Tephrodes;* however, it does not fit in one of the other sections of Vernonia.

(15) **Vernonia subtilis** nov. spec. — Pl. II, 16.

Herbacea, gracilis, parce vel non ramosa, 30—50 cm alta. *Caulis* tenuis, teres, striatus, villosus (pilis articulatis, crispis fulvis), 1½—2 mm crassus, internodiis 4—5 cm longis. *Folia* alterna, petiolata (petiolis ½ cm longis), late ovata, subrotundata, vel ovato-elliptica, apice acuta vel subobtusa (superiora breviter acuminata), mucronata, abrupte attenuata in petiolum, serrata (dentibus obtusis, mucronatis), pinninervia (nervis lateralibus 6—10), supra sparse villosa (ut in caule), verriculosa; subtus in nervis pubescentia, nigro-punctata, membranacea; laminae 3½—10 cm longae, 2—6 cm latae, eae foliorum superiorum sensim minores. *Paniculae* terminales et in axillis foliorum summorum duorum, parvae, capitulis paucis. *Capitula* longe pedunculata (pedunculis gracilibus, ½—2 cm longis, minus quam ½ mm crassis, bracteis minutis praeditis), campanulata, homogama, 18-flora, 6 mm longa, 3 mm crassa. *Involucrum*

2—3-seriatum, breve, $2\frac{1}{2}$ mm longum; squamis oblongis, apice subobtusis et mucronatis, uni-nervibus (nervo dorso incrassato, villoso), circiter 15, in parte superiore purpurascentibus, $\frac{1}{2}$ mm latis; extremis lanceolatis, apice acutissimis, 1 mm longis. *Flores* bisexuales. *Corolla* angusta, tubularis, 5-lobata, 4 mm longa; lobis lanceolatis, apice subobtusis, incrassatis, $1\frac{1}{2}$ mm longis. *Antherae* apice breviter acuminatae, subobtusae, basi breviter obtuse sagittatae. *Stylus* pubescens, ramis brevibus, acutis. *Achenium* obovato-oblongum, obsolete 4—5 angulatum, densiuscule albo-pubescens, obsolete glandulosum, plus quam 1 mm longum, $\frac{1}{2}$ mm crassum. *Pappus* biseriatus, setaceus, fulvido-albus; setis internis 4 mm longis, externis paulo minus $\frac{1}{2}$ mm longis, omnibus ciliatis. *Receptaculum* parvum, alveolatum.

Distribution in the Malay Archipelago:

Celebes: *S.W. Celebes*, Boeloe Tanah, near Lombasang, BÜNNEMEYER 11530 (L), type specimen — id., near Lombasang, BÜNNEMEYER 11648 (B), 11783 (B) — id., near Malino, BÜNNEMEYER 10895 (B).

Flowers (pale) violet (BÜNNEMEYER).

Hab.: in forests, along waysides.

Altitude: 300—850 m.

Flowers: April, May.

Probably endemic.

To be distinguished from *Vernonia cymosa* var. *eupatorioides* by the short involucre, the longer outer row of the pappus and the shape of the leaves.

(16) **Vernonia coerulea** nov. spec. — Pl. II, 21.

Herbacea? *Caulis* teres, striatus, breviter fulvide villosus, 2—4 mm crassus, internodiis 1—7 cm longis. *Folia* alterna, subsessilia vel brevissime petiolata (petiolo 0—$1\frac{1}{2}$ cm longo, incrassato), rhomboideo-elliptica, oblongo-elliptica, elliptica vel ovata, apice longe vel longissime acuminata, acuta vel obtusa, minute mucronata, ad basin sensim attenuata in petiolum, chartacea, subintegra et margine minutissime mucronulata vel integra, subtus glandulosa, pallidiora, pinninervia (nervis lateralibus 12—16, apice arcuate connectis, tertiis anastomosantibus); laminis 6—12 cm longis, $1\frac{1}{2}$—$4\frac{1}{2}$ cm latis; folia superiora angustiora, elliptico-lanceolata, 1 cm lata, 6 cm longa. *Inflorescentia* terminalis et in axillis foliorum superiorum, parva, corymbosa; capitulis paucis; ramis dichotomis, breviter fulvide villosis, basi nudis vel bractea parva lineari praeditis. *Capitula* homogama, parva, pedunculata (pedunculo villoso, 1—6 mm longo), campanulata, circiter 15-flora, 3—4 mm crassa, 5—$5\frac{1}{2}$ mm longa. *Involucrum* 3-seriatum, campanulatum, squamae externe sensim decrescentes, villosae, parce glandulosae, interiores aequales, oblongae apice deltoideae vel subrotundatae, obtusae, uni-nerviae, 3—$3\frac{1}{2}$ mm

longae exteriores lanceolato-lineares, apice acutissimae, 1—2 mm longae. *Flores* bisexuales, 4—5 mm longi. *Corolla* anguste infundibuliformis, 5-lobata, 3—4 mm longa, lobis subobtusis, 1½ mm longis. *Stylus* in parte superiore ciliatus, ramis brevibus. *Antherae* ad basin breviter obtuse sagittatae apice subobtusae. *Achenium* turbinato-cylindricum, subangulatum, 5—6 costatum, dense pubescens, (pilis albidis) minutissime glanduloso-punctatum, 1½—2 mm longum, ½ mm crassum. *Pappus* biseriatus, setaceus, albus; setae interiores caducae, ciliatae, 3—4 mm longae; exteriores minutae. *Receptaculum* subplanum, alveolatum.

1. var. **typica**

Folia supra scabra et parce glandulosa, subtus breviter ferrugineo-villosa, minutissime et dense glandulosa.

Distribution in the Malay Archipelago:

T i m o r: Soemba Madoemba, TEYSMANN 8781 (L), type specimen, (B, K).

This variety seems to be allied to *V. cymosa* var. *eupatorioides*; it is to be distinguished by the small heads, the involucral scales and by the entire or nearly entire leaves.

2. var. **glabrata** nov. var.

Folia utrinque subglabra vel subtus parce pubescentia; subtus glandulosissima.

Distribution in the Malay Archipelago:

S o e m b a: Maomarroe, IBOET 406 (L), type specimen, (B, K) — Laora, IBOET 205 (L, B, U).

Flowers (pale) blue (IBOET).

Vernacular names: *tandalapowa, tegoilawa.*

Hab.: in a forest.

Flowers: April, May.

(17) **Vernonia cymosa** BL.! Bijdr. (1825) 894 — Pl. II, 23—24.

Robustly herbaceous or nearly a shrub, more or less branched, 25—170 cm high. *Stem* and *branches* terete, ribbed (ribs prominent), pubescent, villous or subglabrous, glandular, more or less purplish; stem 8—10 mm thick at the base; internodes 2—9 cm long. *Leaves* petiolate (petioles ½—2 cm long, 1 mm broad), oblong-lanceolate, elliptic-oblong or ovate-elliptic, attenuate at both ends, more or less long acuminate, acute at the top, narrowed into the petiole at the base, more or less rugose, paler beneath, membranous or chartaceous, serrate (teeth ½ mm long, broadly mucronate, subobtuse, 3—5 mm distant, directed forward) or subentire, warty, subglabrous or sparsely pilose above; glandularly spotted, pubescent or villous beneath, pinni-nerved (lateral nerves 5—12 pairs; extreme ones reticulate, often prominent beneath); blades

7—16 cm long, 2—5 cm broad; upper leaves subsessile, lanceolate, 2½—6½ cm long, ½—2 cm broad. *Panicles* terminal, luxurious, ample, corymbose, 5—12 cm high, 9—18 cm broad, branches dichotomous, pubescent, lower ones having a small leaf at the base. *Heads* campanulate, pedunculate (peduncles long, thin, 1—2 cm long, pubescent having 1—3 villous linear bracts at the top of halfway), about 20-flowered, 6—7 mm long, 4—5 mm thick. *Involucre* campanulate, 4-seriate; scales lanceolate, tomentose, glandular, 1-nerved; of the inner row 3½—5 mm long, ½ or nearly 1 mm broad, subobtuse and mucronate or nearly rounded, sometimes minutely serrate at the top; of the outer rows narrow, sharply acuminate; of the extreme row 1 mm long. *Flowers* exceeding the involucre. *Corolla* infundibuliform, glandular, 4—5 mm long, 5-lobed; lobes lanceolate-linear, subobtuse, slightly pubescent at the top, 1—2 mm long. *Style*-branches pubescent. *Anthers* shortly sagittate at the base (tails subobtuse), acute at the top. *Achene* narrowly oblong, obscurely 5-angular, glandular, sparsely whitish appressed-pubescent, 1—1½ mm long, ½ mm wide. *Pappus* biseriate; setae of the inner row silky, white minutely ciliate, 4—5 mm long; outer row existing of minute flattened hairs, permanent, forming a strawy fringe at the top of the achene. *Receptacle* flat, alveolate; margins of the pits paleaceous.

Distribution: Sumatra, Java.

1. var. **typica**; *Vernonia cymosa* BL.! Bijdr. (1825) 894; DC. Prod. V (1836) 26; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 221; MIQ.! Fl. Ind. Bat. II (1856) 13; BOERL. Fl. Ned. Ind. II (1899) 235; *Vernonia rugosa* BL.! Bijdr. (1825) 894; DC. Prod. V (1836) 26; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 221; MIQ.! Fl. Ind. Bat. II (1856) 13; BOERL.! Fl. Ned. Ind. II (1899) 235; KOORDERS Exc. Fl. Java III (1912) 315; HOCHREUTINER in Candollea V (1931—1934) 298; *Vernonia vialis* SCH.-BIP.! (non DC.) in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ. Fl. Ind. Bat. II (1856) 12; BOERL. Fl. Ned. Ind. II (1899) 235.

Stem and *branches* thinly appressed-pubescent on the ribs (hairs fulvous or greyish, straight) or subglabrous; *leaves* more or less pubescent on the nerves beneath.

Distribution in the Malay Archipelago:

Sumatra: *West Coast*: G. Singalang, BÜNNEMEYER 2523 (L), 2578 (L), 2589 (B), 2976 (B) — G. Merapi, BÜNNEMEYER 1256 (B), 4521 (L, U), 4778 (L) — G. Malintang, BÜNNEMEYER 3514 (L) — G. Talang, BÜNNEMEYER 5176 (L) — Boekit Batoe, Banting, JACOBSON s.n. (B) — G. Koeriman, LKoto, BÜNNEMEYER 3288 (B) — S. A. Ramboetan, LKoto, BÜNNE-

MEYER 3408 (L) — Fort de Kock, Karbouwengat, BÜNNEMEYER 1301 (B).

Java: *West Java*: Tjibodas, Priangan, SAPIIN 2567 (U, B), BOERLAGE s.n. (L, B), HALLIER 80 (B), 442 (B), RAAP 660 (L), KOORDERS 31833 (B), BRUGGEMAN 189 (B), VAN STEENIS 1863 (B) — Tjihandjawar, near Wanajasa, s. of Poerwakarta, BAKHUIZEN VAN DEN BRINK 4320 (L, K) — Tjikopo, Buitenzorg, BOERLAGE s.n. (L) — Kapala tjiburrum, G. Gede, BLUME s.n. (L) — G. Papandajan, BOERLAGE s.n. (L), KORTHALS s.n. (L) — Tankoban Prahoe, KORTHALS s.n. (L) — Bandoeng, VAN DER VEEN s.n. (L) — id., Tjinjiroean, DOCTERS VAN LEEUWEN s.n. (B), SMITH and RANT 548 (B), ZEYLSTRA 3 (B), coll. unknown (B) — Priangan, plant. Malabar, PULLE 2661 (U), DENKER 107 (B) — G. Malabar, ANDERSON 350 (K) — G. Telagabodas, Priangan, BACKER s.n. (B), KOENS 281 (B) — G. Mandalagiri, LAM 203 (B) — Buitenzorg, HALLIER s.n. (B) — Garoet, BURCK 147 (B), VAN VUUREN s.n. (B), KOORDERS 26650 (B) — Noesagede in the lake of Pendjaloe, KOORDERS 48002 (B) — G. Galoengoeng, BACKER 8623 (B) — G. Boerangrang, BACKER 14176 (B), Wanajasa, BAKHUIZEN VAN DEN BRINK 4652 (B) — G. Goentoer, KOENS 379 (B) — G. Gede, south slope, BACKER 15191 (B), id. Tjisaroea, VAN STEENIS 4448 (B) — Sindanglaya, Priangan, VALETON s.n. (B) — Bandoeng, SOEGANDIREDJA 257 (B) — Rongga, near Bandoeng, LÖRZING 1256 (B) — Lembang, near Bandoeng, VAN WELSEM 7 (B) — Njalindoeng, BACKER 14580 (B) — G. Tjikoraj, BACKER 5338 (B) — W. Patoeha, near Rantjawalini, Priangan, LÖRZING 1298 (B) — Tjibeber, WINCKEL 1475 (B), BAKHUIZEN VAN DEN BRINK 628 (B) — G. Karang, KOORDERS 40655 (B) — G. Tjeremai, BACKER 4776 (B), 4870 (B), 4916 (B) — G. Beser, near Tjiandjoer, VAN STEENIS 5468 (B); *Middle Java*: G. Prahoe, VAN DER PIJL 291 (B); Java: Oepan Oepan, WAITZ? s.n. (L); Oengaran-Garoeng, DOCTERS VAN LEEUWEN-REYNVAAN s.n. (U); Java, ZOLLINGER 1096 (Br. M.), WAITZ s.n. (L), KORTHALS s.n. (L), BLUME s.n. (L, sub nomine *Vernonia cymosa* BL.), HORSFIELD 13 (K, sub nomine *Vernonia eupatorioides* BL. var. *Horsfieldiana* MIQ.), Pl. Junghuhniana ineditae 52 (K); Java, Jatikalangan, JUNGHUHN 315 (L, U).

Flowers blue (BÜNNEMEYER), violet (KOORDERS a.o.) red (HALLIER); limb of the corolla and style-branches pale lilac; corolla for the rest white (VAN STEENIS). Involucral scales greenish brown (LAM), pale green (VAN STEENIS). Up to 1 m high (VAN STEENIS).

Vernacular names: *ambong ambong* (Sumatra), *sitochoe* (Sumatra), *djonghege* (Soend.), *semboeng* (*beureum*) (Soend.).

Hab.: along waysides, in primeval and second growth forests, in jungles, in Cinchona and tea plantations, as a weed in gardens, along rice-fields; common, many together.

Altitude: 500—2000 m.

Flowers: Jan., March, May, Nov.

Use: the Javanese use the fresh plant after crushing against stomach ache (Waitz); on Sumatra drawn as tea for the same purpose (Bünnemeyer).

The Sumatran specimens have, as a rule, very luxurious inflorescences and small elliptic leaves, sometimes obtuse and mucronate at the top.

The type specimen of *Vernonia cymosa* Bl. has very young buds only; it agrees with the type specimen of *V. rugosa* Bl.

2. var. **eupatorioides** (Bl.) nov. comb.; *Vernonia eupatorioides* Bl.! Bijdr. (1825) 894; Zoll.! in Nat. Gen. Arch. Neêrl. Ind. II (1845) 222; Miq.! Pl. Jungh. (1854) 495; Miq.! Fl. Ind. Bat. II (1856) 14; DC. Prod. V (1836) 26; Boerl. Fl. Ned. Ind. II (1899) 235; Koorders! Exc. Fl. Java III (1912) 315; id. in Nat. Tijdschr. Ned. Ind. LX (1901) 253; Hochreutiner in Candollea V (1931—1934) 297; *Vernonia Horsfieldi* Miq. in Herb. (U), Java, Horsfield; *Vernonia eupatorioides* Bl. var. *Horsfieldiana* Miq. in Herb. (K), Horsfield 13; *Vernonia eupatorioides* Bl. var. *erythrolepis* Miq.! Pl. Jungh. (1854) 495; Miq.! Fl. Ind. Bat. II (1856) 15; Hochreutiner in Candollea V (1931—1934) 297; *Vernonia eupatorioides* var. *tenggerensis* Hochreutiner l.c.; *Vernonia eupatorioides* Bl. var. *parviflora* Miq. Fl. Ind. Bat. II (1856) 15; *Vernonia vialis* Sch.-Bip.? in Zoll. Syst. Verz. Ind. Arch. (1854) 119; Miq. Fl. Ind. Bat. II (1856) 12.

Stem and *branches, leaves* beneath (especially on the nerves) and peduncles villous (hairs spreading, crisped, purplish-brownish striate). Peduncles rigid. *Heads* often large, to 8 mm high, 6 mm thick; *involucral scales* oblong-lanceolate, to 1 mm broad, to 6 mm long, more or less purplish to dark purple. *Corolla* to 6 mm long.

Distribution in the Malay Archipelago:

Java: *West Java*: G. Boerangrang, summit (ex Blume l.c.) — G. Tankoeban Prahoe, Junghuhn 318 (L) — Tjimahi, Priangan, Van Oort, det. Korthals s.n. (L); *Middle Java*: G. Dieng, Wiriosapoetro 41 (L), Junghuhn 361 (L, U), det. Miquel *Vernonia eupatorioides* Bl. var. *erythrolepis* Miq., Teysmann s.n. (B), Brinkman 181 (B), van Steenis 4513 (B), Backer 21627 (B), id., summit, Blokhuis s.n. (B), id. south slope, Backer 21851 (B) — id., G. Pangonau, van Steenis 4555 (L) — G. Merapi, Junghuhn 318 (L) — G. Merbaboe, Junghuhn 361 (L), det. Miq. *Vernonia eupatorioides* Bl. var. *erythrolepis* Miq., Backer 30248 (B), id., south east slope, den Berger 94 (B) — G. Soembing, north north east slope, Lörzing 30 (B) — Petoeng Kriono, Pekalongan, Backer 15813 (B) — Josoredjo, Pekalongan, Backer 16122 (B) — G. Prahoe, Lörzing 480 (B); *East Java*: G. Tengger, Went s.n. (L),

SCHIMPER s.n. (L), ZOLLINGER s.n. (L), KOORDERS 37428 (B), KOBUS s.n. (B), MOUSSET 855 (L), s.n. (Br. M.), HOCHREUTINER 2738 (G) — id., Ngadisari, KOORDERS 37427 (L, K), 37395 (B) — id., Tosari, VAN DER MEER MOHR s.n. (B) — id., Bromo, JESWIET s.n. (B) — id., Oengoep Oengoep, ZOLLINGER s.n. (L) — Katjep, Sitoebondo, OTTOLANDER 350 (B) — Plateau of Idjen, BACKER 25137 (B), KOORDERS 20808 (B), 22212 (B), CLASON-LAARMAN D 89 (B) — id., between Sempal and G. Merapi, BACKER 25267 (B) — Pantjoer-Idjen, Sitoebondo, KOORDERS 28502 (B), 28535 (L), 28532 (L), 32554 (B) — Kawah-Idjen, KOORDERS 43354 (L) — Gendingwaloe, KOORDERS 43356 (L), 43355 (B), 43353 (B) — G. Ardjoeno, BREMEKAMP s.n. (B), RANT s.n. (B) — Nongkodjadjar, WISSE 560 (B) — G. Baloeran, CLASON-LAARMAN F 117 (B) — G. Sigogor, Madioen, KOORDERS 29184 (B) — near the lake of Ngebel, WISSE 734 (B); Java: BLUME 1443 (L), JUNGHUHN s.n. (L), Pl Junghuhnianae ineditae 52 (L), ZOLLINGER 2171 (Br. M.), HORSFIELD s.n. (U), det. MIQUEL sub nomine *Vernonia Horsfieldi* MIQ.

Flowers purplish or bluish violet (ZOLLINGER a.o.), pink (BRINKMAN), slightly fragrant (LORZING); up to 2 m high (BACKER, MOUSSET). More or less decumbent at the base, erect for the rest (LORZING).

Vernacular names: *trasen, semboeng(an), semboeng lakki, djoenggoelan, bak roembaan* (all Java).

Hab.: in Casuarina- and other forests, in jungles, on grassy hills, along waysides, in a ravine, as a weed in gardens, along the edge of a crater; on a sandy dry soil; few or numerous together; common.

Altitude: 600—2700 m.

Flowers during the whole year.

Up to the present time *Vernonia rugosa* and *Vernonia eupatorioides* have considered as two different species. Though the type specimens seem to be sufficiently different, all kinds of intermediate forms are to be found: the specimen from Bandoeng (SOEGANDIREDJA 257) has an indumentum like *Vernonia rugosa*, but there are some articulate, crisped hairs mixed. Most of the specimens of *Vernonia eupatorioides*, collected on the G. Dieng are thinly villous.

Both species are mostly identified as *Vernonia cinerea* (L.) LESS. They are easy to be distinguished from that species by the achenes which are 5 angular, the shape of the leaves and the involucral scales, which are obtuse and mucronate at the top.

3. var. **Teysmanniana** (MIQ.) nov. comb.; *Vernonia Teysmanniana* MIQ.! Fl. Ind. Bat. II (1856) 14; BOERL. Fl. Ned. Ind. II (1899) 235.

Stem, branches and *leaves* thinly villous (hairs spreading, crisped, striate) beneath. *Leaves* lanceolate, subsessile, long attenuate and acute at both ends; 7—8 cm long, 1—1½ cm broad. Scales of the *involucrum* linear-lanceolate, very long and sharply gradually attenuate at the top.

Distribution in the Malay Archipelago:

Java: *East Java*: G. Wilis, TEYSMANN s.n. (U, K) det. MIQUEL, TEYSMANN, Herb. Sulp. KURZ s.n. (B).

4. var. **incana** nov. var.

Caulis, rami et pedunculi dense pilis incanis appressis vestiti. *Folia* elliptico-oblonga vel oblongo-lanceolata, longe mucronato-serrata (mucronibus dentium 1 mm longis, acutis), nervis fulvide lanato-villosis subtus; reticulatio subtus valde prominens. Squamae *involucri* interiores apice longe et acutissime acuminatae.

Distribution in the Malay Archipelago:

Java: *East Java*: G. Hijang, KOORDERS 43637 (B), type specimen, BACKER 9586 (B) — id. G. Argopoero, BACKER 13296 (B) — G. Tengger, BEUMÉE A 631 (B), ZOLLINGER 1486? (L), sub *Vernonia vialis* DC.? det. ZOLLINGER — G. Andjasmoro, west slope, above Segoenoeng, WINCKEL 82 (B) — Nongkodjadjar, VAN OOSTEN s.n. (B) — G. Kawi, DOCTERS VAN LEEUWEN 12470 (B); Java: JUNGHUHN pl. ineditae 52 (L).

Flowers (pale) violet (ZOLLINGER a.o.); shrub (DOCTERS VAN LEEUWEN).

The indumentum of the branches of the specimen from Gendingwaloch (KOORDERS 43353 (B)) is partly like that of *Vernonia cymosa* BL. var. *eupatorioides*, partly like that of *Vernonia cymosa* BL. var. *incana*.

IV. Sectio **Cyanopis** BL. Fl. Javae (1828) VI (nomen nudum); DC. Prod. V (1836) 69; MIQ. Fl. Ind. Bat. II (1856) 18; BENTH. et HOOK. Gen. Pl. II (1873—1876) 229 (p.p.); OLIVER Fl. trop. Afr. III (1877) 268 (p.p.); HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 126 (p.p.); *Cyanthillium* BL. Bijdr. (1825) 889.

Pubescent herbs. *Leaves* subsessile or shortly petiolate, narrowed into the petiole, pilose or white tomentose, often glandular beneath. *Heads* broadly campanulate, pedunculate, many-flowered, cymose or corymbose, or few together at the top of dichotomous branches. *Involucral scales* linear-lanceolate to oblong, acute to very pointed at the top. *Anthers*-tails acute or subobtuse. *Achene* 4—7 (mostly 5)-angular, glandular, glabrous or subglabrous. *Pappus* uniseriate, caducous.

Trop. Asia and Africa.

Key to the species.

1. a. Heads 5—10 mm long, 4—10 mm wide; involucral scales lanceolate, very acute at the top or ending into a prickle; inner ones with scarious edges. Achene 1—1½ mm long, having a thickened ring at the top. (18) **V. patula.**

   b. Heads large, 10—11 mm long, 9 mm wide; involucral scales oblong, having a long needle at the top and scarious fringed edges. Achene 1½—2 mm long, having a prominent disc at the top . . . (19) **V. moluccensis.**

(18) **Vernonia patula** (DRYAND.) MERRILL in Phil. Journ. Sci. III (1908) 439.

Herbaceous, nearly shrubby, 20—70 cm high. *Roots* crowded, numerous. *Stem* much branched at the base and all along the stem, terete, ribbed, sparsely pubescent (hairs long, appressed), sometimes purplish, 2—8 mm thick; branches spreading, younger ones greyish villous; internodes ½—7½ cm long. *Leaves* very variable, petiolate or subsessile (petioles 3—20 mm long), more or less broadly ovate, ovate-elliptic, nearly circular or elliptic, suddenly attenuate into the petiole, acute at the base, acuminate and acute or obtuse and mucronate at the top, mucronately serrate or mucronately repandate or subentire, subglabrous or slightly pubescent, minutely warty, dark coloured above, greyish silky villous (hairs fairly long) or felty tomentose or subglabrous, glandular beneath, pinni-nerved (nerves more or less prominent beneath, lateral ones 3—5 pairs), membranous or chartaceous; blades 2½—10½ cm long, 1—4½ cm broad; superior leaves subsessile, smaller, to ½ cm broad and 1½ cm long. *Heads* fairly many, few together (3—5) at the top of dichotomous branches, pedunculate(peduncles 1—4½ cm long, in the axils of the upper leaves and at the top of the branches; bearing one or two heads (if two, the heads are on differently long peduncles, 3—15 mm long), having a linear bract at the base or higher on) campanulate, subglobular. *Involucre* 4-seriate, scales ending into a prickle, dark coloured on the upper central part, sparsely greyish villous, more or less glandular, sometimes purplish, attenuate at the top; inner ones oblong-lanceolate or lanceolate, mucronate at the top, 1—3-nerved, 1—1½ mm broad, with narrow scarious edges; outer ones subulate, 1-nerved; extreme ones 3 mm long, terminating into a prickle (1 mm long). *Flowers* hardly exceeding the involucre, numerous. *Corolla* infundibuliform (subcampanulate at the superior part), 5-lobed, lanceolate, oblong, subacute at the top, glandular, having few hairs at the superior part, about $^1/_3$ of the length of the corolla. *Style*-branches short, acute. *Anthers* acuminate, acute at the top, sagittate at the base (tails long, subobtuse). *Achene* obovate-oblong, 4—6 (mostly 5)-angular (ribs prominent), glabrous, glandular, 1—1½ mm long, ½ mm wide, having a thickened ring at the top. *Pappus* uniseriate, caducous, setaceous; setae obscurely ciliate, white, 2 mm long. *Receptacle* nearly flat or convex, alveolate.

Distribution: Mal. Penins., Indo-Chine, S. China, Japan, Formosa. Philippines, Mal. Arch., New Guinea.

1. var. **typica**; *Conyza patula* DRYAND. in AITON Hort. Kew. III (1789) 184, WILLD. Sp. Pl. III (1804) 1919; *Vernonia patula* MERRILL,

in Phil. Journ. Sci III (1908) 439; MERRILL Enum. Phil. III (1923) 594; MATTF.! in Engl. Bot. Jahrb. LXII (1929) 400; BACKER Handb. Suikerr. VII (1932) 752; *Conyza chinensis* LAM. (non LINN.) Enc. II (1790) 83; *Cyanthillium villosum* BL.! Bijdr. (1825) 889, *Centratherum chinense* LESS. in Linnaea IV (1829) 320; *Vernonia chinensis* LESS. in Linnaea VI (1831) 105, 674; MIQ. Pl. Jungh. (1854) 496; BENTH. Fl. Hongk. (1861) 169; CLARKE! Comp. Ind. (1876) 18; KURZ in Journ. As. Beng. XLVI 2 (1877) 200; HOOK. Fl. Br. Ind. III (1882) 235; FORBES et HEMSLEY in Journ. Linn. Soc. Bot. XXIII (1886—1888) 401; WARBURG in Engl. Bot. Jahrb. XIII (1891) 448; BOERL. Fl. Ned. Ind. II (1899) 235; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV 2 (1905) 26; ELMER Leafl. Phil. Bot. I (1906) 93; MATSUMURA et HAYATA in Journ. Sci. Tokyo XXII (1906) 201; KOORDERS Exc. Fl. Java III (1912) 314; RIDLEY Fl. Mal. Penins. II (1923) 188; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 469; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1430; HOCHREUTINER in Candollea V (1931—1934) 297; *Cyanopsis villosa* DC. Prod. V (1836) 69; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 223; *Cyanopsis pubescens* (non DC.) Zoll.! in Nat. Gen. Arch. Neêrl. Ind. II (1845) 223; SCH.-BIP.! in Zoll. Syst. Verz. Ind. Arch. (1854) 120; *Vernonia accedens* MIQ.! Fl. Ind. Bat. II (1856) 18; BOERL. Fl. Ned. Ind. II (1899) 235; KOORDERS Excl. Fl. Java III (1912) 315; *Vernonia chinensis* LESS. var. *villosa* MIQ. Fl. Ind. Bat. II (1856) 18; *Cyanthillium chinense* (LAM.) GLEASON in Bull. Torr. Bot. Club XL (1913) 306.

Leaves more or less densely greyish silky villous, submembranous or chartaceous. *Heads* broadly campanulate, 75—100-flowered, 6—8 mm wide. *Involucre* broadly cup-shaped, nearly as long as the head, 6—8 mm long. *Corolla* 3—4 mm long.

Distribution in the Malay Archipelago:

S u m a t r a: *Atjeh*: Gajo and Alas-districts, Panampakan, Exped. VAN DAALEN 268 (L, B) — Takengon, VAN STEENIS 6152 (B) — Alas-valley, near Koetatjane, LÖRZING 11114 (B); *East Coast*: near Medan, LÖRZING 3100 (B), 3729 (B), 3775 (B) — Sibolangit, LÖRZING 3884 (B) — plateau of Karo, near Singga manik, GALOENGI 3 (B) — Karo-districts, near Perbesi, LÖRZING 8814 (B) — Asahan, BARTLETT and LA RUE 150 (K) — Tandjoeng Morawa, LÖRZING 3987 (B); *Tapanoeli*: Toba, OUWEHAND 137 (B), 267 (B) — Baliga, near the lake of Toba, LÖRZING 8048 (B) — near Pangoerocran, P. Samosir in the lake of Toba, LÖRZING 7659 (B); *West Coast*: Indrapoera, KORTHALS s.n. (L) — Koerintji, Bt. Tebakar, BÜNNEMEYER 7927 (L, K, U) — Koerintji, Singarong agong, ROBINSON and KLOSS 2450 (K, Br. M.) — Koerintji, Sandaran agong,

Robinson and Kloss s.n. (K) — Koerintji, Kota Gadang, Bünnemeyer 8260 (B) — G. Sago, Bünnemeyer 3655 (B); *Djambi*: near Bangko, Posthumus 553 (L, B) — Pahoe, Posthumus 1078 (L, U, B, K) — Doessoen Baroe, Posthumus 880 (B) — Djambi, Posthumus 671 (B); *Lampongs*: estate Wai Lima, Iboet 331 (B); Sumatra, Korthals s.n. (L).

Simaloer: Achmad 731 (L, U).

Riouw Arch.: *P. Bintan*, Senggarang, Bünnemeyer 6505 (L, U, K).

Lingga Arch.: *P. Lingga*: Resoem, Bünnemeyer 6766 (L, K); P. Lingga, Bünnemeyer 7039 (L).

Java· *West Java*: Batavia, Zollinger s.n. (L), Raynaud s.n. (L), Piepers s.n. (B), Vorderman s.n. (B), Backer 32930 (B) — south of Tji Kampek, Batavia, van Steenis 4751 (B) — between Buitenzorg and Tjipanas, Wintersbottom s.n. (K) — Buitenzorg, Koorders 32664 (B), Scheffer s.n. (B), Bakhuizen van den Brink 2179 (B), Hallier 155a (B) — Tjampea, Koorders 31473 (L) — Wanajasa Backer 14362 (B) — Tjendo, Batavia, Backer 24023 (B) — Depok, Koorders 31299 (L) — S.W. of Depok, Bakhuizen van den Brink 5733 (L, B) — Krawangea, Batavia, Beumée 5406 (B) — G. Salak, foot, Bakhuizen van den Brink 335 (B), 3676 (L, U) — Pendjaloe, Priangan, Koorders 48003 (L) — west of G. Masigit, Priangan, van Steenis 4437 (B) — G. Papandajan, foot, Boerlage s.n. (L) — Garoet, Koens 315 (B), 42 (B), 160 (B), 60 (B), Burck s.n. (B) — Bandoeng, Eyken s.n. (B), Backer 32933 (B) — Poerwakarto, Backer 13778 (B) — Pasaoeran, Bantam, Backer 7276 (B) — Rankasbitoeng, Bantam, Backer 1008 (B) — near Krawang, Korthals s.n. (L), van Steenis 4437 (B) — Radjamandala, Priangan, Backer 13478 (B) — near Soekaboemi, G. Kate, Backer 15055 (B) — Soekaboemi, Backer 14627 (B) — near Tjebeber, Priangan, Backer 22914 (B), Bakhuizen van den Brink 56 (B) — between Tjiandjoer and G. Malabar, Backer 3132 (B) — Bandjar, Backer 4342 (B) — Tjitjalenka, Wisse 861 (B) — G. Goentoer, Winckel 1975 (B) — Sindanglaya, Valeton s.n. (B) — Pandaglang, Backer 7503 (B) — Bandoeng, van Steenis 1697 (B) — Tjisaroea, near Buitenzorg, Raap 852 (L); *Middle Java*: Soebah, Pekalongan, Koorders 27345 (L) — G. Sendoro, Lörzing 357 (B) — Brebes, Backer 15423 (B) — Banjoemas, Backer 18546 (B) — near Poerwokerto, Backer 107 (B) — Wonosobo, Serajoe-valley, Brinkman 301 (B) — Semarang, Koorders 25215 (B) — G. Moeria, near Petjangaän, Koedoes, Docters van Leeuwen 771 (U, B) — Regaloh, Semarang, Beumée 637 (B), 3945 (B) — Kedoengdjati, Koorders 24926 (L), 25073 (B), 27251 (B) — Djoewono, Semarang, Teysmann s.n. (B)

— between Randablatoeng and Blora, BLOKHUIS s.n. (B) — near Blora, BLOKHUIS s.n. (B) — Tempoeran, Semarang, BEUMÉE 5100 (B) — Djapara, Jawana, Semarang, KOORDERS 34928 (B) — Pasokan, Djapara, KOORDERS 41210 (B); *Soerakarta*: between Djepitoe and Kalak, G. Kidoel, BACKER 2808 (B) — Solo, HEMKEN s.n. (B); *East Java*: Madioen, KOORDERS 23370 (B) — S. Kediri, KRAMER 153 (B) — Poeger, Djember, KOORDERS 20549 (L), 20550 (L) — Blambangan, HORSFIELD, det. MIQ. sub nomine *Vernonia accedens* MIQ., s.n. (U) — Tjoeramanis, near Malang, KOORDERS 28748 (B) — Bondowoso, VORDERMAN 2772 (B); Java, BLUME, sub nomine *Cyanthillum villosum* BL., s.n. (L), KORTHALS s.n. (L), HORSFIELD 12, sub nomine *Vernonia accedens* MIQ., s.n. (K), JUNGHUHN s.n. (L), ZOLLINGER 2673 (Br. M.), 6 (L, K, Br. M), det. SCH.-BIP. (L).

Kangean Arch.: *P. Sepandjang*, BACKER 28852 (B).

Borneo: *S. Borneo*, Banjermassin, MOTLEY 312 (K) — G. Pamattin, KORTHALS s.n. (L).

Celebes: Bontoparang, south of Makassar, Exped. VAN VUUREN 12 (L) — Baloe Parigi, near Tanetti, S.W. Celebes, BÜNNEMEYER 12485 (L) — P. Wali, VAN VUUREN 377 (B) — Badjo, Manado, VAN VUUREN 201 (B) — near Gorontalo, FORSTEN s.n. (L).

Moluccas: *Ceram*: RANT 189 (B).

Flowers purple (DOCTERS VAN LEEUWEN), pale violet (BAKHUIZEN VAN DEN BRINK), tube of the corolla white to pale violet, limb purple; rarely whole flower white (ex BACKER l.c.); branches of the style purple, anthers pale violet (ex BACKER l.c.). Erect herb, up to 1 m high (KOORDERS, LÖRZING).

Vernacular names: *gletang warak, menjawang menjawang, njawoenan, lontja piit, gletangan, singa tadjem, trasèn, wegètan, jawoen, tjamoening* (all Java), *boejoeng boejoeng* (Bali), *sriawan, proewangi, njirang poetih* (all Sum.), *galoengi karo karo timoelingga* (Karo-districts), *alioto oeding* (Simaloer).

Hab.: in teak and other forests, in jungles, in dry and wet rice-fields, in maize-fields, along waysides, ponds and ditches, in kampongs, in grassy fields, on dikes; mostly on sunny, sometimes shady, dry (rarely less dry) soils; on sandy soils, on marly linestone, on weathered tuff; common, few or numerous together.

Altitude: 0—1200 m.

Flowers during the whole year.

Distribution: Japan, China (Fukien!, Canton!, Yunnan!, Hainan!, Hongkong!, Kwantung!), Formosa!, Burma!, Annam!, Cochinchina!, Tonking!, Laos, Cambodge, Siam!, Mal. Penins.!, Penang!, Philippines (Luzon!, Negros!, Paragua, Mindoro!, Panay!), Carolines!, Marianne Islands!, New Guinea, Bismarck Arch. Introduced into America (ex MATTF. l.c.; West Indies, ex GLEASON l.c.).

2. var. **pubescens** (BL.) nov. comb.; *Cyanthillium pubescens* BL.! Bijdr. (1825) 890; *Cyanopis pubescens* DC. Prod. V (1836) 69.

Leaves greyish thinly felty tomentose or subglabrous beneath, mem-

branous. *Heads* narrowly campanulate, 25—40-flowered, 4—6 mm wide. *Involucre* narrowly campanulate, 5—7 mm long. *Corolla* elongated, 4—5 mm long.

Distribution in the Malay Archipelago:

Java: *West Java*: Batavia, JUNGHUHN 334 (L), HALLIER 776 (B), chinese cemetry, HALLIER s.n. (B), KOORDERS 32928 (B) — Buitenzorg, BOERLAGE s.n. (L), BAKHUIZEN VAN DEN BRINK 6896 (B), KOORDERS 32617 (B), 32664 (B), SOEGANDIREDJA 117 (B), 118 (B), BACKER 5943 (B) — G. Batoe, Priangan, RAAP 566 (L); *Middle Java*: Poerwokerto, BACKER 4 (B) — Kradenan, Blora, WEDA 2985 (B) — Djapara, KOORDERS 33497 (B); *Soerakarta*: Klaten, LEEFMANS 123 (B), 131 (B); *East Java*: Ngawi, BACKER 6654 (B) — res. Madioen, WISSE s.n. (B) — Madioen, BACKER 6863 (B) — S. Soerabaja, BEUMÉE 2615 (B) — Gadoengan, Pare, KOORDERS 41498 (L) — Tangkil, Southern hills, KOORDERS 22656 (L) — near Manggis, near Soekoredjo, KOORDERS 22914 (B) — Kediri, BACKER 11264 (B) — Prigi, Kediri, BACKER 11856 (B) — Gondang, near Malang, BACKER 3460 (B) — Malang, WISSE 236 (B) — G. Tengger, BUIJSMAN s.n. (U), MOUSSET 201 (B) — Kepandjen, Malang, ISMAIL 31 (B) — G. Bentar, near Probolinggo, BACKER 24310 (B) — Lawang, BLOKHUIS s.n. (B) — Pasoeroean, DOCTERS VAN LEEUWEN 8994 (B) — Djatiroto, BACKER 8078 (B) — res. Pasoeroean, BACKER 24170 (B) — Bangil, BACKER 7589 (B) — Tarokan, Pasoeroean, BEUMÉE 2826 (B) — Ranoe Klakah, Pasoeroean, VAN SLOOTEN 2391 (B) — Soemberwaroe, Bondowoso, KOORDERS 43903 (L) — Tjoeramanis, Djember, KOORDERS 28748 (B), 28750 (B) — Asembagoes, Bondowoso, BACKER 8176 (B) — Sitoebondo, BACKER 24432 (B) — Ardjasa, near Sitoebondo, BACKER 24752 (B) — Poeger, BACKER 17772 (B) — G. Idjen, BACKER 24944 (B); Java, BLUME, sub nomine *Cyanthillium pubescens*, s.n. (L), HORSFIELD 14 (K), herb. SCH.-BIP. (K).

Madoera: Soemenep, BACKER 20622 (B) — Amboenten, BACKER 21236 (B) — Pamekasan, BACKER 20344 (B) — Sampang, BACKER s.n. (B) — Tanahmerah, BACKER 19369 (B) — Kamal, DOCTERS VAN LEEUWEN s.n. (U, B) — Bangkalan, BACKER 19060 (B) — Rapa, BACKER 20276 (B) — Balega, BACKER 19520 (B) — Madoera, VORDERMAN 150 (B).

Bali: N.W., VAN DER PAARDT 78 (B) — G. Kelatakan, MAIER 93 (L).

Timor: CURTIS s.n. (K).

Kangean Arch.: P. Sepapan, BACKER 28467 (B) — P. Mamboerit, BACKER 27256 (B) — P. Saoebi, BACKER 28213 (B) — P. Kangean, BACKER 28034 (B) — P. Saseel, BACKER 28708 (B) — P. Saèboes,

BACKER 29092 (B) — P. Sapeken, BACKER 29284 (B) — P. Paliat, BACKER 29308 (B) — P. Saboenten, BACKER 29731 (B).

P. Kalao Tao, south of Celebes, DOCTERS VAN LEEUWEN 1362 (U, B).

Halmahera: TEYSMANN 5655 (B).

Hab.: in teak- and other forests, on hills and dunes, in jungles and grassy fields, along waysides, on an old wall; on a sandy, sometimes on a volcanic soil. As a rule abundant, very common.

Altitude: 1—1100 m.

Flowers during the whole year.

Twice a monstrous form of this variety has been collected: West Java: near Batavia, BACKER 32932 (B), East Java: Penanggal, Loemadjang, ZOLLINGER 2673 (B) (det. ZOLL. sub *Cyanopis pubescens* monstrum). In these specimens the heads consist of a 6-seriate involucre with spirally inserted scales; they are like the external ones of a normal involucre of *Vernonia patula.* The peduncle of the head is elongated beyond the involucral scales and bears about 15 or more very short tomentose branches, covered with scales like the involucral ones, very closely spirally inserted; these branches (covered with scales) are clustered at the superior part (which is widened) of the elongated peduncle, which in normal heads is the receptacle. The elongated peduncle terminates into a bundle of scales. One of the collected plants has a branch, which bears monstrous heads as well as normal ones.

There are many intermediate forms between *Vernonia patula* and its variety *pubescens* on the one side, between *Vernonia patula* and its variety *multiflora* on the other hand.

3. var. **multiflora** nov. var.

Folia dense incane villosa, chartacea. *Capitula* pauca (2—3) apice ramulorum, magna, late campanulata, circiter 150-flora, 8—10 mm crassa. *Involucrum* late cupuliformis, 8—10 mm longum, squamis lanceolatis, acutissimis. *Corolla* 4 mm longa. *Achenium* $1\frac{1}{2}$ mm longum.

Distribution:

Middle Java: Grobogan, Blora, DE BOER 26 (B), type specimen — Karangasem, Semarang, KOORDERS 28229 (L) — Sedan, Rembang, KOORDERS 36143 (B) — Bekoetoek, Rembang, BLOKHUIS s.n. (B).

Tanimbar Islands (Timorlaoet), RIEDEL s.n. (K).

New Guinea: Finschhafen, WEINLAND s.n. (B), New Ireland, PEEKEL 85 (L), Stephansort, LEWANDOWSKY s.n. (L).

Philippines: Luzon, Spec. Blancoanae 235 (L).

Hab.: in teak forests; on marly clay.

Altitude: 50—70 m.

Flowers: June, Aug.

Evidently this variety with large heads has its distribution in the eastern part of the Malay Archipelago.

(19) **Vernonia moluccensis** (BL.) MIQ.! Fl. Ind. Bat. II (1856)

19; BOERL. Fl. Ned. Ind. II (1899) 235; MERRILL in Phil. Journn. Sci. XI (1916) 138; *Vernonia aristata* REINW.! in Herb. Reinwardt. 1289; *Cyanthillium moluccense* BL.! Bijdr. (1825) 890; *Cyanopis moluccensis* DC. Prod. V (1836) 69; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 223, 563 — Pl. I, *d*.

Herb, 40—50 cm high; branched at the base and all along the stem. *Stem* terete, densely ribbed, glandular, sparsely pubescent (hairs long, dingy whitish), 2½—3½ mm thick; internodes 2½—4½ cm long. *Leaves* sessile or nearly so, narrowly spathulate-oblong or oblong-lanceolate, more or less long and sharply acuminate at the top, long attenuate, cuneate at the base, minutely mucronately repandate, membranous, pinni-nerved (lateral nerves 6—10 pairs, nerves prominent beneath), sparsely pubescent (hairs long, appressed), glandularly spotted above, more or less densely appressedly silvery tomentose, glandular beneath; 2½—13½ cm long, ½—3½ cm broad; superior ones gradually smaller. *Heads* at the top of dichotomous branches, 2—4 together, inequally pedunculate (peduncle ½—5 cm long, greyish tomentose), subglobose, large, campanulate, many-flowered, 10—11 mm long, 9 mm wide. *Involucre* campanulate, 5-seriate; scales pubescent or subglabrous, glandular, with broad scarious colourless fringed margins, 5-nerved; inner ones oblong, acute at the top, ending into a prickle (about 1 mm long), 9—11 mm long, 2—2½ mm broad; outer ones lanceolate to elliptic, with a gradually longer needle at the top; extreme ones 3½—6 mm long (needle 1½—4½ mm long, very long of the type specimen). *Flowers* numerous, hardly exceeding the involucre. *Corolla* infundibuliform, slender, 5-lobed, glandular, 7—8 mm long; lobes acute, pilose at the top, 3 mm long. *Style*-branches long, slender, acute. *Anthers* acute at the top. *Achene* obovate-oblong, 5—7 ribbed (ribs very prominent) glabrous, very glandular (glands prominent) between the ribs, 1½—2 mm long, nearly 1 mm wide, with a scarious prominent disc at the top. *Pappus* uniseriate setaceous, caducous; setae ciliate, white, 4 mm long. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

Celebes: Djeneponto, to the south of Makasser, BOUMAN-HOUTMAN 10 (B).

Moluccas: BLUME, sub nomine *Cyanthillium moluccense*, s.n. (L); *Amboina*, ROBINSON 1334, 1839 (ex MERRILL l.c.).

Timor: Soembo Madoemba, TEYSMANN 8780 (L); P. Solor, near Timor, REINWARDT 1289 (L).

Lombok: ZOLLINGER 18 (L), RENSCH 388 (B).

Bali: Herb. PRAETORIUS s.n. (L, K).

Flowers violet (RENSCH).

Vernacular name: *biana peroempoean* (ex MERRILL l.c.).

Hab.: in bushes on the beach, in clearings in light forests (ex MERR. l.c.), on limestone-formation (ex MERR. l.c.).

Altitude: 0 m. (RENSCH), 175 m, 3000 m (ex MERR. l.c.).

Flowers: April, Aug. (ex MERR. l.c.), Sept. (ex MERR. l.c.).

Vernonia moluccensis is closely related to *Vernonia patula* and differs by the larger heads (though hardly larger than those of *Vernonia patula* var. *multiflora*), the oblong involucral scales with scarious fringed edges and a long needle at the top and the longer achenes with a prominent scarious disc at the top.

Vernonia (*Cyanopis*) *subsimplex* MIQ.! Sumatra (1862) 535 is not a *Vernonia*, having heterogamous heads. The filiform ray-flowers are female, the central ones have only one degenerated anther and a style like the female ones. It seems to be a *Blumea*. *On the same sheet* (H. A. R. T. 03653) a specimen of *Conyza viscidula* WALL. is to be found, but MIQUEL's description certainly points to the species of *Blumea*.

V. Sectio **Claotrachelus** ZOLL. et MOR. (genus) in Nat. en Gen. Arch. Neêrl. Ind. II (1845) 565; *Cyanopis* BENTH. et HOOK. Gen. Pl. II (1873—1876) 229 (p.p.); OLIVER Fl. trop. Afr. III (1877) 268 (p.p.); HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 126 (p.p.).

Herbs or shrubs, pubescent, rarely glabrous. *Leaves* sessile or petiolate, lanceolate, elliptic, subspathulate, ovate, pubescent (rarely glabrous), glandular (rarely without glands) beneath. *Heads* paniculate, or few together, small, pedunculate, campanulate, 12—30- (mostly 20) flowered. *Involucral scales* lanceolate, rarely oblong, mostly pubescent, usually acute at the top. *Anthers* shortly sagittate at the base; tails acute or obtuse. *Achene* 5-angular (rarely 3-angular), ribs often prominent, mostly densely glandular, glabrous, pubescent between or on the ribs. *Pappus* biseriate, setaceous; setae of the outer row short, often minute, flattened.

Trop. Asia and Africa.

The section *Claotrachelus* is based on the genus of the same name, described by ZOLLINGER in Nat. en Gen. Arch. Ned. Ind. II (1845) 267, 565. This genus contains one species, *C. rupestris* (*Vernonia Zollingeriana* SCH.-BIP.). ZOLLINGER indicates the pappus to be uniseriate and the setae to break off (when ripe) slightly above the foot, leaving a broadened setaceous, fringed border. This border, however, is the outer row of the pappus, consisting of short setae; thus the pappus is biseriate, the inner row being caducous.

Key to the species.

1. a. Achene 5-angular, glabrous or pubescent between or on the ribs . . 2
   b. Achene pseudo-alate, 5-costate; grooves between the ribs puberulous. (25) **V. floresiana.**
   c. Achene 3-angular; outer side smooth, glabrous; the two inner sides much grooved; ribs pilose . . . . (26) **V. letiënsis.**
2. a. Inflorescence small, corymbosely paniculate or branches of the inflorescence obliquely spreading or few heads (1—2) at the top of the stem. Achene glabrous, pubescent or having few hairs on the ribs 3
   b. Branches of the inflorescence clearly dichotomous, spreading, rigid, straight. Achene very white pubescent between the ribs . . . . (20) **V. erigeroides.**
3. a. Involucrum campanulate; scales pubescent or villous 4
   b. Involucrum nearly basin-shaped; scales glabrous . . . . (22) **V. Zollingerianoides.**
4. a. Stem fulvously appressed-tomentose or greyish villous. Leaves elliptic or elliptic-lanceolate. Heads paniculate, 15—20-flowered 5
   b. Stem dispersed-hirsute (hairs spreading, perpendicular on the stem, slightly curved). Leaves oblong-spathulate. Heads few, 1—2 together at the top of the stem, 30-flowered . . . (23) **V. Zollingeriana.**
5. a. Leaves entire or slightly mucronulate; heads 20-flowered, 5—6 mm long, 5 mm wide; peduncles short, 2—5 mm long. (21) **V. wetarensis.**
   b. Leaves mucronately serrate. Heads 15-flowered, 7—8 mm long, 5—6 mm wide; peduncles slender, 1—1½ cm long. (24) **V. Reinwardtiana.**

(20) **Vernonia erigeroides** DC. Prod. V (1836) 25; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 221; MIQ. Fl. Ind. Bat. (1856) 13; BOERL. Fl. Ned. Ind. II (1899) 235; KOSTER in Fedde Repert. XXXIV (1933) 3; *Cyanopis erigeroides* DC. in WIGHT Contr. Bot. Ind. (1834) 7; *Vernonia diffusa* DCNE! (non LESS.) Herb. Timor. (1835) 80; *Vernonia affinis* SCH.-BIP.! in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ. Fl. Ind. Bat. II (1856) 17; *Vernonia cinerea* (L.) LESS. var. *erigeroides* FORBES Wand. Mal. Arch. (1866) 216 — Pl. I, *c*; II, 25—26.

Herbaceous, much branched, especially at the upper part, to 1¼ m high. *Stem* pubescent or subglabrous, clearly ribbed, glandular, terete, 1½—6 mm thick; *branches* mostly thinly leaved, spreading, rigid, straight, elongated, obviously dichotomous, glandular, pubescent at the top; internodes 1½—2½ cm long. *Leaves* sessile or shortly petiolate (petioles 3 mm long), linear-lanceolate, long attenuate, acute or subacute at both ends, scabrous above; very glandular, greyish or fulvously thinly tomentose, paler beneath; chartaceous, pinni-nerved (4—8 pairs of lateral nerves; reticulation obscure), entire edges recurved; lower leaves lanceolate-elliptic or spathulate-elliptic, long atttenuate at both ends, mucronately dentate at the upper part, more or less scabrous above, pubescent beneath,

(lateral nerves about 12 pairs); leaves of the stem 3—7 cm long, 2—20 mm broad; of the branches gradually smaller to the top; lower leaves 9—14 cm long, 1½—4½ cm broad. *Inflorescence* loosely subpaniculate, to 25 cm wide; branches spreading, dichotomous, rigid, straight; heads 1 or 2 together at the top of clearly dichotomous ramifications (much differing in length), pedunculate (peduncles slender, ½ mm thick, with one or more minute linear bracts at the base or higher on; peduncles of the two heads at the top of the ramifications different in length, the shorter one 1—5 mm, the longer one 4—12 mm long), campanulate, 20-flowered, 5—6 mm long and nearly as wide. *Involucre* campanulate, 5-seriate; scales lanceolate, silky whitish pubescent, glandular, 1-nerved; of the inner row shortly acutely mucronate at the top, with membranous edges, 4—4½ mm long, nearly 1 mm broad; of the 4 outer rows needle-shaped, subulate, recurved at the upper part. *Flowers* exserting the involucre. *Corolla* infundibuliform, 5-lobed, 4½ mm long; limb glandular, 3 mm long; lobes subacute, half as long as the limb, slightly pilose at the top; tube very short. *Style* pubescent at the superior part; branches long, acute, shortly pubescent. *Anthers* shortly sagittate at the base (tails obtuse); acute at the top. *Achene* obovate-oblong, 5-angular (ribs prominent); densely covered with shining glands and shortly, very white, scarcely pubescent between the ribs, 1 mm long, ½ mm wide. *Pappus* setaceous, biseriate; setae white, ciliate, of the inner row silky, 3 mm long; of the outer row minute, flattened. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

J a v a: *East Java*: Pasoeroean, ALTMANN 116 (B) — id., Grati, BEUMÉE 2780 (B) — Kepoeh near Pasoeroean, BACKER 8296 (B), 24183 (B) — G. Hijang, Tjemoro Pandjang, CLASON-LAARMAN G 30 (B) — Asembagoes, Bondowoso, BACKER 8224 (B) — west of Panaroekan, BACKER 24677 (B) — Soemberwaroe, Bondowoso, KOORDERS 43933 (L) — G. Baloeran, foot, BACKER 24813 (B) — G. Idjen, north slope, BACKER 24945 (B) — Bondowoso, Ranoe, ZOLLINGER 2762 (B); this specimen has many bracts on the peduncles — Bondowoso, BACKER 24503 (B) — Mandowora, CLASON-LAARMAN F 49 (B) — Cape of Sitoebondo, Doewet, ALTMANN 368 (B).

M a d o e r a: TEYSMANN 1739 (B).

L o m b o k: G. Rindjani, ELBERT 1943 (L).

S o e m b a w a: Bima, G. Kolo, ELBERT 3629 (L) — id., Donggo, ELBERT 3509 (L) — id., Toentoe, ELBERT 3550 (L) — id., Waworadja bay, GRÜNDLER 3843 (L) — id., south of Bima, POSTHUMUS 3018 (B) — Dompoe, RENSCH 829 (B).

Flores: Badjawa, HORST 18 (B) — Rana mose, RENSCH 1208 (B) — Endeh, RENSCH 978 (B) — Bari bay, WEBER s.n. (L) — Ndona valley, between Woro-Toro and Ndetoe Sokka, POSTHUMUS 3098 (B).

Timor: Koepang, BROWN s.n. (L, Br. M.), TEYSMANN s.n. (L, B); West Timor, BOUMAN-HOUTMAN s.n. (B); north Moetis, Kaslioe, WALSH 331 (B); Timor, ZIPPELIUS s.n. (L), DECAISNE, sub nomine *Vernonia diffusa* DECAISNE, s.n. (L), coll. unknown (K).

Saleier: TEYSMANN 13880 (L), 13878 (B), DOCTERS VAN LEEUWEN 1834 (U, B); *P. Bonerate*, DOCTERS VAN LEEUWEN 1424 (U, B).

Flowers pink (BACKER), violet (RENSCH, DOCTERS VAN LEEUWEN), purple (DOCTERS VAN LEEUWEN, WALSH).

Hab: in monsoon and teak forests, in jungles, in an alang alang field, along steep waysides, along the edge of a ditch, in bushes near the sea; usually on a dry, sometimes on a more or less wet soil; on sand, marl, clay, tuffs; few or numerous, scattered

Altitude: 0—1800 m

Flowers: Febr.—Aug, Nov, Dec.

Distribution. Australia (acc to DC; acc to MIQUEL on the islands along the westcoast of Australia).

DE CANDOLLE was right in lifting out *Cyanopis cinerea* from that genus (which is now a section of *Vernonia*), placing it in the section *Tephrodes*.

(21) **Vernonia wetarensis** KOSTER in Fedde Repert. XXXIV (1933) 3 — Pl. III, 29

Herbaceous, small, 20—30 cm high; branched at the lower part. *Stem* terete, ribbed, greyish velvety villous, 2 mm thick; internodes ½—2 mm long. *Leaves* petiolate (petioles ½—1 cm long), elliptic, obtuse or acute at the top, attenuate into the petiole, entire or slightly mucronudate, warty, glandular, shortly velvety above, paler, very glandular, velvety villous, pinni-nerved (nerves prominent beneath; lateral ones 6—8); blades 3—4 cm long, 12—20 mm broad, upper ones smaller. *Panicles* small, (existing of 4—6 heads), terminal and at the top of the branches; branches of the inflorescence obliquely spreading out, long extending over the terminal small panicle; lower part naked or nearly so; upper part branched, ending into a small panicle; branchlets of the panicles dichotomous, greyish velvety villous, bearing linear bracts. *Heads* pedunculate (peduncles 2—5 mm long, thin, bearing 1—3 linear, minute bracts), campanulate, 20-flowered, 5—6 mm long, 5 mm thick. *Involucre* campanulate, 3-seriate, 3—4 mm long; scales villous, hardly glandular, interior ones oblong, acute at the top, 3-nerved, exterior ones linear-lanceolate sharply acuminate at the top. *Corolla* infundibuliform, 5-lobed, 4½ mm long; lobes 2 mm long, subobtuse at the top, slightly pilose. *Style*-branches pubescent, short. *Anthers* subacute at the top;

tails subobtuse. *Achene* obovate-oblong, 5-angular (ribs prominent), very glandular, glabrous, 1½ mm long, ½ mm thick. *Pappus* biseriate, white; setae of the inner row 3 mm long, of the outer row very small, scale-like; all ciliate. *Receptacle* flat, naked.

Distribution in the Malay Archipelago:

W e t a r: Iliwâki, slopes, ELBERT 4403 (L).

Hab.: in an Eucalyptus forest; on a dry soil, on volcanic tuffs.

Altitude: 150—450 m.

Flowers: Febr.

(22) **Vernonia Zollingerianoides** SCH.-BIP.! in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ. Fl. Ind. Bat. II (1856) 16; BOERL. Fl. Ned. Ind. II (1899) 235; *Vernonia rupestris* HOOK. Index Kew. I (1895) 552; KOORDERS Exc. Fl. Java III (1912) 315, non GARD. — Pl. III, 33—35 (when the figures had been drawn, another much better specimen was obtained, in which the corolla appeared to be more incised, the achene pubescent and the inner involucral scales lanceolate-oblong).

Small herb. *Stem* quite glabrous, subterete, faintly ribbed, 2—3 mm thick; internodes 3—25 mm long. *Leaves* subsessile, oblong-spathulate or elliptic-spathulate, entire, obtuse or nearly rounded at the top, gradually long attenuate at the base, glandularly black spotted beneath, minutely warty above, quite glabrous on both sides, fleshy (?), pinni-nerved (lateral nerves about 3 pairs, inconspicuous), 6—11 mm broad, 2—4½ cm long. *Heads* few together, 4—8, in thin corymbose panicles in the axils of the upper leaves or terminal, pedunculate (peduncles 1 mm wide, 5—12 mm long, with 5—7 minute linear bracts at the base and higher on), small, about 30-flowered, 3½—5½ mm high, 6 mm wide. *Involucre* nearly basin-shaped, 4-seriate, 2½—3½ mm long; scales minutely serrate, 1-nerved, glabrous, glandular; of the inner rows oblong or lanceolate-oblong, subobtuse and shortly mucronate, of the outer rows lanceolate, sharply acuminate at the top. *Flowers* exceeding the pappus. *Corolla* tubular, 5-lobed, 3 mm long; limb long. *Anthers* sagittate at the base (tails acute); tip fairly long, subobtuse. *Style*-branches short. *Achene* small, turbinate, 5-angular, subglabrous or pubescent, slightly glandular, ½—1 mm long. *Pappus* biseriate, white; setae of the inner row ciliate, 1½—2 mm long, caducous; setae of the outer row flattened, ciliate, very acute at the top, short, numerous (about 16), different in length, permanent. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

J a v a: *East Java*: Noesa Baron, to the south of Poeger, ZOLLINGER 2403, 2705 (ex SCH.-BIP. l.c.) — Poeger, Batoeoeloe, ALTMANN 370 (B).

Flowers violet (ZOLLINGER).

Hab.: on (bare) rocks; scarce.
Altitude: 2 m.
Flowers: Oct.

In the Leiden herbarium, a *Vernonia* is to be found (H. L. B. 901, 94—108), to which a label is added, on which SCHULTZ—BIPONTINUS has written: „Vernonia Zollingerianoides Sz.-Bip! Batavia: Zollinger! 1849 n. 2403." Though the origin is not clear, it may be the type specimen. In the herbarium at Buitenzorg a *Vernonia* (932. 1. 1304) is preserved, to which a label is added, on which ZOLLINGER has written: „2705 Z. M., Claotrachelus 2403 var. glabra; Fl. lilacini; Ad rupes In. Nusa Baron 21 II 45". This specimen is *Vernonia cinerea* (L.) LESS. var. *parviflora* (BL.) DC. The original plant (probably the type specimen) may have been lost or commutated with the specimen in the herbarium at Leiden, mentioned above. There is no doubt, whether this species is a good one; it is to be distinguished at once by its glabrous, fleshy (?), spathulate leaves and its small heads. Only the leaves of *Vernonia actaea* are like those of *Vernonia Zollingerianoides*, but that species has narrow 7—9-flowered heads on very short peduncles. The name *Vernonia rupestris* (ZOLL.) HOOK. Index Kew. I (1895) 522, is invalid, as there exists a *Vernonia rupestris* GARD. in HOOK. Lond. Journ. Bot. IV (1845) 114 from Brazil. Thus the name *Vernonia Zollingerianoides* SCH.-BIP. has to be maintained.

Vernonia Zollingerianoides seems to be related to *Vernonia wetarensis* but it is quite glabrous, its involucre is much shorter, the outer row of the pappus is longer, shape and size of the corolla are different. With *Vernonia cinerea*, as KOORDERS supposes, it has scarcely any resemblance.

(23) **Vernonia Zollingeriana** SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 119; MIQ.! Fl. Ind. Bat. II (1856) 16; *Claotrachelus rupestris* ZOLL. et MOR. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 268, 565.

Small herb, 20 cm high. *Stem* subangular, ribbed, dispersed-hirsute (hairs spreading, perpendicular on the stem, slightly curved) without glands, 1½ mm thick; internodes irregular; here very short (1—2 mm long), there longer (½—1½ cm long). *Leaves* subsessile, oblong-spathulate, very long attenuate at the base, subacute at the top, entire, densely brownish hirsute on both sides (hairs like those of the stem), pinninerved (nerves hardly to be seen), without glands, coriaceous, fleshy (ex ZOLLINGER l.c.), 3 cm long, ½ cm broad at the upper part, 1 mm broad at the attenuate lower part. *Heads* few, 1 or 2 together at the top of the stem, long pedunculate (peduncles 1½—2 cm long, with 2—4 linear bracteoles), campanulate, about 30-flowered. *Involucre* campanulate, 4-seriate; scales without glands; inner ones linear-lanceolate, 3-nerved, pubescent, acute and mucronate at the top, 4 mm long; outer ones lanceolate, sharply acuminate at the top, 1-nerved, shortly hirsute (hairs spreading); extreme ones 1 mm long. *Corolla* (very young) tubular, glabrous, without glands, 5-lobed; limb long, tube short; lobes short, thickened and nearly rounded at the top. *Anthers* shortly sagittate at the base, tails and top obtuse. *Style*-branches pubescent. *Achene* (very

young) oblong, attenuate at the base, angular, 5-ribbed, glabrous. *Pappus* biseriate, setaceous, white; setae ciliate, of the outer row short. *Receptacle* flat, alveolate.

Distribution:

Java: Malang near Šri Gontjo, ZOLLINGER 2403 (ex SCH.-BIP. l.c.).

Flowers bluish violet (ex ZOLLINGER l.c.). Stem prostrate, branched (ex ZOLLINGER l.c.).

This description is prepared from a fairly bad specimen in the herbarium at Utrecht, to which is added only a label, on which MIQUEL has written: „Vernonia Zollingeriana Sch.-Bip., Java in rupibus, ZOLL.". Most probable this is the type specimen (ZOLLINGER 2403), of which the label has got lost.

Hab.: on limestone rocks, very rare.

Flowers: Oct.

HOOKER (Fl. Br. Ind. III, 1882, 234), BOERLAGE (Fl. Ned. Ind. II, 1899, 235) and KOORDERS (Exc. Fl. Java III, 1912, 314) placed this species to the synonyms of *Vernonia cinerea*. It is to be distinguished from that species by the 5-angular glabrous achenes (which are very young), the spreading curved hairs, covering the whole plant, the fleshy leaves, and the absence of glands.

From *Vernonia Zollingerianoides* it is to be distinguished by the hairs, covering the whole plant, by the larger heads and by the involucre.

Vernonia maritima MERRILL in Phil. Journ. Sci. III (1908) 440 is very closely related, if not synonymous to this species. This cannot be decided with certainty, on account of the bad specimen of *Vernonia Zollingeriana*. Some trifling differences are to be found in *Vernonia maritima*: the peduncles are very short (2—4 mm long), but the specimen examined, Batanes Islands, FÉNIX 3670 (K), has only young heads; the involucral scales are glandular. Both specimens have been collected on rocks near the sea.

(24) **Vernonia Reinwardtiana** DE VRIESE et MIQ.! Fl. Ind. Bat. II (1856) 15; BOERL. Fl. Ned. Ind. II (1899) 235; KOORDERS in Meded. L. Pl. XIX (1898) 510 — Pl. II, 22.

Herb, or nearly shrub, 30 cm or higher, branched. *Stem* terete, obscurely ribbed, densely fulvously appressed-tomentose, 2 mm thick; internodes 1½—4½ cm long. *Leaves* shortly petiolate (petioles 3 mm long, tomentose like the stem) small, elliptic or elliptic-lanceolate, gradually narrowed into the petiole at the base, acuminate, mucronate at the top, mucronately serrate (teeth sharp, directed forward, 3—5 mm distant), roughly warty, sparsely pubescent above, fulvously villous on the nerves, densely glandular, paler beneath, chartaceous or subcoriaceous, pinni-nerved (nerves prominent beneath, about 5 pairs of lateral nerves, extreme ones reticulate), upper ones not differing much in size; blades 3—6½ cm long, 7—24 mm broad; short leafy branches in the axils of the leaves. *Inflorescence* small, terminal, loosely corymbosely paniculate, dichotomous, leafless, 4—6 cm wide, 5—10 cm long. *Heads* campanulate,

pedunculate (peduncles long, slender 1—1½ cm long, having a minute, linear bract at the base of halfway), about 15-flowered, 5—6 mm wide, 7—8 mm long. *Involucre* 3-seriate, campanulate; scales villous, slightly grandular; of the inner row narrowly lanceolate, gradually narrowed, acute at the top, 4 mm long, ½ mm broad; of the second row linear-lanceolate, subulate at the top, of the outer row linear, subulate at the top, 1½ mm long. *Flowers* much exceeding the involucre, 7—8 mm long. *Corolla* 5-lobed, 5½—6½ mm long, exceeding the pappus; limb infundibuliform, 4½ mm long, lobes lanceolate, subacute at the top, pilose at the superior part, 2½ mm long. *Anthers* shortly sagittate at the base, subobtuse at the top (tip short). *Style* ciliate at the superior part, branches long. *Achene* narrowly barrel-shaped, angular 5-ribbed, densely covered with shining glands, glabrous or subglabrous (having few hairs on the ribs) 1½—2 mm long. *Pappus* biseriate, setaceous; setae ciliate, of the inner row 4 mm long, of the outer row numerous, short, nearly 1 mm long. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

Celebes: *Manado*: G. Sempo, summit, REINWARDT s.n. (L) — G. Sopoetan, around the crater, KOORDERS 16506 L, B) — id., G. Rindengan, KOORDERS 16497 (L, B) — G. Lokon, summit, KOORDERS 16500 (B).

Flowers white (KOORDERS), violet (KOORDERS); herb to ½ m high.

Vernacular names: *lawet randang, lenal in taloen, roekoet weroe* (all Celebes).

Hab.: in primeval forests, in a barren open plain around the crater; on volcanic sand; not common. Apperently endemic.

Altitude: 1100—1500 m.

Flowers: Jan., May, Oct.

Related to *Vernonia cymosa*, from which it is to be distinguished by the small elliptic leaves, the sharp involucral scales, the very glandular glabrous achene and the longer outer row of the pappus hairs.

As to the pappus this *Vernonia* seems to belong to the section *Tephrodes*, in which section MIQUEL placed it. On account of the angular achenes it is preferable to place this species in the section *Claotrachelus*.

(25) **Vernonia floresiana** nov. spec. — Pl. III, 30—31.

Herba parva, annua (?), 10—20 cm alta. *Radix* brevissimus. *Caulis* tenuis, subangulatus, pubescens (pilis albidis, appressis), glandulosus, 1 mm crassus; internodiis 1 cm longis. *Folia* parva, alterna, subsessilia vel breviter petiolata (petiolis 0—3 mm longis), elliptica vel obovato-elliptica, apice subobtusa, mucronata, ad basin sensim attenuata, subtiliter argute serrata, pinninervia (nervis subtus prominentibus, laterali-bus 8—10, connectis; reticulatione obsolete), utrinque brevissime pubes-centia (pilis nonnullis longis, fulvide striatis inter pilos brevissimos

intermixtis), subtus minutissime glandulosa, submembranacea, 2—2½ cm longa, ½—1 cm lata. *Inflorescentia* terminalis et in axillis foliorum superiorum, parva, (capitulis 10—15), corymboso-paniculata, ramis basi folium parvum, apice pedunculos duos ferentibus. *Capitula* pedunculata (pedunculis tenuis, 6—10 mm longis, bracteis filiformibus 1—3 praeditis), campanulata, 15-flora, 6—7 mm longa, 5 mm crassa. *Involucrum* 4-seriatum, 5 mm longum, squamis externe decrescentibus, interioribus oblongo-lanceolatis, acutis, apice acutissime mucronatis, parce glandulosis, albide pubescentibus, margine ciliatis, exterioribus subulatis angustissimis. *Flores* bisexuales, involucrum paulo superantes. *Corolla* anguste infundibuliformis, eglandulosa, 5-lobata, 5 mm longa; lobis lanceolatis, apice acutis, parce pilosis, 1½ mm longis. *Antherae* ad basin sagittatae, apice subacutae. *Stylus* bifurcatus; rami hirsuti, apice acuti, tenui. *Achenium* obovato-cylindricum, 5-costatum, crassum, glandulosum, 1½ mm longum, ½ mm latum, costis prominentibus, achenium quasi alatum, foveis inter alas albo-puberulis, alis glabris. *Pappus* biseriatus, setaceus, setis albis. ciliatis, interioribus caducis, 3½ mm longis, exterioribus persistentibus, applanatis, brevibus. *Receptaculum* planum, alveolatum.

Distribution in the Malay Archipelago:

F l o r e s: Badjawa, RENSCH 1064 (B), type specimen.

Flowers bluish violet (RENSCH).

Hab.: in an alang alang field; numerous.

Altitude: 1200 m.

Flowers: June.

This *Vernonia* differs from all others by the nearly winged achenes. For the rest it seems to be related to *Vernonia Zollingeriana*; the leaves of this species have a different pubescence, however, the heads contain about twice as much flowers. As the shape and size of the flowers of the only available fragmentary specimen of *Vernonia Zollingeriana* could not be examined very well, these important parts can hardly be compared. From *Vernonia wetarensis* this species differs in the achenes, the involucre, the size of the heads and the hairs of the leaves. From *Vernonia patula* it differs by the achenes and the pappus.

(26) **Vernonia letiënsis** nov. spec. — Pl. III, 32.

Herba plusquam 42 cm alta, ramosa. *Rami* elongati, sparse scabridi, in parte inferiore glabri, glandulosi, striati, rufescentes, 2—3 mm crassi; internodia 4 cm longa. *Folia* alterna, petiolata (petiolis scabride pubescentibus, 2—4 mm longis), ovata, apice subacuta et breviter mucronulata, ad basin subrotundata vel abrupte attenuata in petiolum, integra, margine revoluta, utrinque breviter et sparse scabrida, glandulosissima, supra nitida, chartacea, pinninervia (nervis lateralibus utrinque 3), 2—1½ cm longa, 1—1½ cm lata, superiora elliptica, utrinque attenuata, minora ad 1 cm longa, 4 mm lata. *Inflorescentia* diffusa, dichotoma; ramis in parte

inferiore longiter nudis; apice ramulos dichotomos ferentibus, terminantes in capitula 2 vel 1. *Capitula* pedunculata (pedunculis gracilibus, pubescentibus, 4—15 mm longis, bractaea parva lineari praeditis), homogama, campanulata, 20-flora, 7 mm longa, 6 mm crassa. *Involucrum* 4-seriatum; squamis sensim externe decrescentibus lineari-lanceolatis, parce pubescentibus, glandulosis, minus quam 1 mm latis, interioribus 3-nervatis, apice acutis, breviter mucronatis 5 mm longis, exterioribus 1-nervatis, acutissimis. *Flores* bisexuales. *Corolla* anguste infundibuliformis, sparse pilosa, glandulosa, 3½ mm longa, lobis lanceolatis, brevibus, pilosis, apice acutis, minusquam 1 mm longis. *Antherae* ad basin sagittatae, apice acutae. *Stylus* bifurcatus; rami breves. *Achenium* 1½ mm longum, paulo minus 1 mm crassum, obovatum, subtriquetrum, apice subratundatum, breve, crassum, glandulosum; latere externo sublaevo, glabro; lateribus interioribus profunde foveolatis, costis pilosis (pilis brevibus, superne appressis, albidis, nitidis). *Pappus* biseriatus, setis albis, ciliatis, interioribus 3 mm longis, exterioribus minutis, subplanis. *Receptaculum* planum, alveolatum, cicatricibus acheniorum angulatis.

Distribution in the Malay Archipelago:

P. Leti, near Timor, RIEDEL, comm. Dr. A. MEYER s.n. (K), type specimen.

Flowers: Aug.

This *Vernonia* is much related to *Vernonia floresiana* and *Vernonia wetarensis*, but it is a much taller herb; it is to be distinguished chiefly by the achenes.

VI. Sectio **Decaneurum** DC (genus, sect. *Gymnanthemum*) Prod. V (1836) 67; MIQ. (id.) Fl. Ind. Bat. II (1856) 21; OLIVER Fl. trop. Afr. III (1877) 268 (except the species with a pluriseriate pappus); HOFFM. in ENGL.-PRANTL IV 5 (1894) 26; *Gymnanthemum* BENTH. et HOOK. Gen. Pl. II (1873—1876) 229, CLARKE Comp. Ind. (1876) 7.

Herbs or shrubs, erect or scandent, glabrous or pubescent. *Leaves* petiolate or subsessile, oblong, ovate, obovate, attenuate or acute at the base, acuminate and acute or obtuse at the top, entire or dentate, more or less pubescent beneath. *Heads* pedunculate, few, corymbose or paniculate, 5- to many-flowered. *Involucral scales* oblong or ovate, appressed, mostly glabrous, mucronate, acute or obtuse at the top. *Anther*-tails long or short, acute or obtuse. *Achene* oblong, subterete, 10-ribbed, mostly glabrous, sometimes pubescent, glandular or without glands. *Pappus* reddish, uniseriate or nearly so.

Distribution: Trop. Asia and Africa.

Key to the species.

1\. a. Leaves brownish pubescent on the nerves or subglabrous beneath. Heads 9—13 mm long, 3½—7 mm wide 2
   b. Leaves woolly tomentose beneath. Heads very large, 2½ cm long and as wide . . . . (30) **V. Forbesii.**
2\. a. Heads 5—7-flowered; achene glabrous, glandular . (27) **V. cuneata.**
   b. Heads 10—12-flowered; achene glabrous, without glands . . . . (28) **V. vagans.**
   c. Heads 20—25 flowered; achene shortly pubescent, glandular . . . (29) **V. blanda.**

(27) **Vernonia cuneata** LESS. in Linnaea VI (1831) 644; non ELMER; *Gymnanthemum obovatum* GAUDICH. Voy. Uran. Bot. (1826) 471; *Decaneuron? obovatum* DC. Prod. V (1836) 67; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 223; MIQ. Fl. Ind. Bat. II (1856) 21; *Strobocalyx obovatus* SCH.-BIP. in Pollichia XVIII—XIX (1861) 172; *Vernonia obovata* BOERL. Fl. Ned. Ind. II (1899) 235; MATTF.! in Engl. Bot. Jahrb. LXII (1929) 398; non LESS.; *Vernonia polyantha* WARBG. (ex MATTF.) in Engl. Bot. Jahrb. XIII (1891) 447; BOERL. Fl. Ned. Ind. II (1899) 235; *Vernonia lenticellata* ELMER! Leafl. Phil. Bot. I (1906) 91; MERRILL Enum. II (1923) 593; *Vernonia papuana* LAUTERBACH! in Nova Guinea VIII 2 (1910) 335; *Vernonia Klossii* S. MOORE! in Journ. Bot. XLI (1923) suppl. 27 — Pl. 1, *e*.

Scandent shrub. *Stem* subterete, subglabrous or appressed, shortly pubescent, irregularly ribbed, warty glandular, to 4 mm thick; internodes 3—8 cm long. *Leaves* petiolate (petioles ½—1 cm long), broadly elliptic-obovate, long attenuate into the petiole, acute at the base, abruptly and very shortly narrowed at the top, sometimes apiculate (tip acute or blunt, shortly brownish crispy hirsute on the nerves only (younger ones pubescent), glandular beneath, glabrous above, subcoriaceous, entire, pinni-nerved (lateral nerves 5—10 pairs, arcuately connected at the top, extreme ones reticulated, nerves prominent beneath); blades 7—17 cm long, 3—7 cm broad; superior leaves elliptic, gradually narrowed to both ends. *Panicles* large, pyramidate, at the top of the side-branches, 24—30 cm long, 16—20 cm broad at the base; side-branches perpendicular (or nearly so) on the principal axis, shortly brownish pubescent, widened at the base, having a leaf (of the higher ones smaller) at the base. *Heads* shortly pedunculate (peduncles pubescent, 2 mm long, having a minute linear bract halfway), clustered at the top of the side-branches and the principal axis, cylindric, 5—7-flowered, 9—11 mm long, 3½ mm wide. *Involucre* cylindric, 4-seriate; scales stiff, subcoriaceous, convex, ciliate, 1—1½ mm broad, of the inner row oblong, subdeltoid and acute

at the top, glabrous, glandular, caducous, 5—6 mm long, of the outer row subglabrous, shortly narrowed and mucronate at the top, slightly glandular, afterwards spreading; of the second row oblong, 3 mm long, of the third row ovate, 2 mm long, of the outmost row ovate, 1 mm long. *Flowers* 1 cm long. *Corolla* tubular-infundibuliform, 5-lobed, 6—7 mm long; limb 2½—3 mm long, gradually attenuate into the slender tube; lobes lanceolate, acute at the top, glandular, 2—2½ mm long. *Anthers* exceeding the corolla, long acuminate at the top (tip acute); tails obtuse. *Style*-branches short, slightly pubescent, obtuse. *Achene* narrowly oblong-turbinate, slender, about 10-ribbed, angular, glabrous, covered with shining glands, ½ mm wide, 4 mm long. *Pappus* uniseriate, more or less reddish, consisting of numerous obscurely ciliate setae, 7 mm long. *Receptacle* small, flat, alveolate.

Distribution in the Malay Archipelago:

Moluccas: *Amboina*, ZIPPELIUS s.n. (L), BINNENDIJK s.n. (B); *Ceram*, to the S.E. of Piroe, RUTTEN 2101 (L); *Halmahera*, P. Tidore Boekoe Mala Mala, LAM 3774 (B).

Kai Islands:, JAHERI 44 (B).

Aroe Islands, (ex MATTF.).

Leaves glossy, dark green, paler beneath (LAM).

Vernacular name: *gilaha* (Halmahera).

Altitude: 0—100 m.

Flowers: March, July.

Distribution: Philippines (Luzon!, Panay!); New Guinea!, Bismarck Arch., Rawak.

CLARKE (Comp. Ind., 1876, 26) and KURZ (in Journ. As. Soc. Beng. XLVI 2, 1877, 202) suggest *Decaneurum? obovatum* DC. to be a synonym of *Vernonia vagans* (WALL.) DC. Though the two species are closely related, *Vernonia vagans* (WALL.) DC. is different by the larger, 12-flowered heads, the narrower involucral scales, the achene without glands and the narrower elliptic leaves. The geographical areas are adjoining.

(29) **Vernonia vagans** (WALL.) DC. Prod. V (1836) 32; CLARKE Comp. Ind. (1876) 26; *Conyza vagans* WALL.! Cat. (1828) 3040 comp. 150; *Conyza scandens* WALL.! Cat. (1828) 3060 comp. 170; *Vernonia scandens* DC. Prod. V (1836) 32; CLARKE Comp. Ind. (1876) 26 (syn. excl.); KURZ in Journ. As. Soc. Beng. XLVI 2 (1877) 202; HOOK. Fl. Br. Ind. III (1882) 241.

Scandent. *Branches* terete, ribbed, brownish scabridly pubescent, glandular, 2½ mm thick; internodes 3—4½ cm long. *Leaves* petiolate (petioles ½ cm long), obovate, shortly acute at the top, gradually attenuate into the petiole, pinni-nerved (nerves prominent beneath, lateral ones about 5 at every side, arcuately connected at the top), entire,

chartaceous, glandular at both sides, glabrous above, brownish pubescent, especially on the nerves beneath; blades 4—6 cm long, 2½—3 cm broad; of the higher leaves gradually smaller. *Inflorescence* paniculate, narrowly pyramidate; side-branches perpendicular on the principal axis, short (4½—5½ cm long), in the axil of a small leaf; 5—10 heads on every side-branch. *Heads* large, pedunculate (peduncles 2—5 mm long, occasionnally bearing a linear small bract) oblong, 10—13 mm long, 5—6 mm wide, 10—12-flowered. *Involucre* 6-seriate; scales acute at the top, glandular, pubescent at the superior part, slightly fringed at the edges, inner ones oblong, 3-nerved, 6 mm long, 1½ mm broad; outer ones ovate, to 1 mm broad. *Corolla* sparsely glandular, 5-lobed, 7—8 mm long; tube very slender, 4½ mm long, limb widely infundibuliform, 3 mm long; lobes broad, acute, half as long as the limb. *Anthers* narrow, long, sagittate at the base, subobtuse at the top. *Style*-branches long, slender. *Achene* (immature), linear-oblong, glabrous, ribbed, without glands. *Pappus* reddish, uniseriate; setae ciliate, 8 mm long. *Receptacle* small, flat, alveolate, glabrous.

Distribution in the Malay Archipelago:

Sumatra: *Djambi*, S. Kembang, Robinson and Kloss, Korintji exped. s.n. (K, Br. M.).

Altitude: 1350 m.

Flowers: April.

Distribution: Bengal!, Himalaya, Silhet, Assam!, Sikkim, Burma.

(29) **Vernonia blanda** (Wall.) DC. Prod. V (1836) 32; Clarke Comp. Ind. (1876) 25; Kurz in Journ. As. Soc. Beng. XLVI 2 (1877) 202; Hook. Fl. Br. Ind. III (1882) 241; *Conyza blanda* Wall.! Cat. (1828) 3033 comp. 143; *Vernonia scandens* Gagnep. (non alior.) in Lec. Fl. Indo-Chine III (1924) 468.

Scandent, *branches* terete, ribbed, more or less glandular, glabrous or shortly greyish pubescent, 2½—4 mm thick; internodes ½—6 cm long. *Leaves* petiolate (petioles 2—4 mm long), elliptic-obovate, apiculate (tip acute or blunt), gradually narrowed into the petiole, entire, glabrous above, subglabrous beneath, except in the angles of the midrib and the lateral nerves, glandular beneath, pinni-nerved (nerves prominent beneath; lateral ones 4—5 at each side; extreme ones clearly reticulate), edges recurved, coriaceous, blades 4½—11 cm long, 2—5 cm broad. *Heads* in small axillary and terminal, leafy panicles, consisting of about 5 heads or solitary in the axils of the upper leaves. Heads on long peduncles (peduncles greyish shortly pubescent, 8—18 cm long, bearing 3—5 minute leaves at the superior part), 20—25-flowered, 12—13 mm long, 7 mm

thick. *Involucre* 5—6-seriate; scales strawy, oblong-lanceolate, acute at the top, ciliate at the margins, glabrous, glandular, inner ones 7—8 mm long, 1½ mm broad, outer ones 2 mm long. *Flowers* 13 mm long. *Corolla* infundibuliform-tubular, 9 mm long, 5-lobed; tube slender, hardly longer than the narrow limb, lobes acute. *Anthers* acute at the top. *Style*-branches subacute *Achene* narrowly oblong-turbinate, subterete, slightly angular, about 10-ribbed, glandular, shortly pubescent (hairs spreading), 3½—4 mm oblong, 1 mm wide. *Pappus* uniseriate, consisting of numerous reddish, ciliate hairs (8 mm long). *Receptacle* flat, alveolate, glabrous.

Distribution in the Malay Archipelago:

Borneo: *Br. N. Borneo*: G. Kinabaloe, Tenompok, CLEMENS 28604 (L, B, K), leaves very small, 3½—4 cm long, 1½—2 cm broad; Banguey Island, KLOSS 19223 (B), CASTRO and MELEGRITO 1515 (Br. M.), 1356 (K).

Hab.: in a jungle near a trail.

Altitude 1500 m.

Flowers April, Febr., Sept.

Distribution Burma!, Siam, Laos, Cochinchina, Annam.

This species is much allied to *Vernonia scandens*, but the heads possess twice as many flowers and the achene is pubescent

DC (Prod V, 1836, 32) has placed *Vernonia vagans*, *Vernonia scandens* and *Vernonia blanda* in the section *Lepidaploa*, CLARKE (Comp. Ind, 1876, 9) put them in the section *Strobocalyx*

Much allied to *Vernonia blanda* is *Vernonia tavoyana* FISCHER (in Kew Bull., 1927, 92); it differs from *Vernonia blanda* in the involucre, which is 4—5-seriate; inner involucral scales oblong lanceolate, 8 mm long, 2 mm broad; outer ones ovate-oblong, shortly acute or obtuse at the top, ciliate at the margins, pubescent at the top; corolla glandular.

A specimen of *Vernonia tavoyana* from Pegu has been identified by CLARKE as *Vernonia blanda*.

(30) **Vernonia Forbesii** MOORE! in Journ. Bot. LXIII (1925) Suppl. 54.

Scandent; *branches* subterete, striate, densely pubescent. *Leaves* elliptic, mucronate at the top, narrowed into the petiole (petioles 6—8 mm long), entire or slightly repandate, scabrous above, woolly tomentose beneath, afterwards glabrous, glandularly spotted above, chartaceous, 4—8 cm long, 1½—3½ cm broad. *Heads* in the axils of the upper leaves, pedunculate (peduncles fulvously pubescent, 2—3 cm long), very large, 2½ cm high and as wide, many-flowered. *Involucre* campanulate, 8-seriate; scales long acuminate, outer ones linear-lanceolate, pubescent, recurved, 5 mm long, inner ones lanceolate, herbaceous, pubescent, recurved, 9 mm long, innermost oblong, shorter acuminate, scarious,

herbaceous, pubescent on the upper part, 15 mm long. *Flowers* exceeding the involucre. *Corolla* infundibuliform-tubular, 1 cm long; limb 4 mm long, 5-lobed; tube slender; lobes oblong, obtuse, 2½ mm long. *Style*-branches 3½—4 mm long. *Achene* turbinate-linear, 10-ribbed, very shortly pubescent, glandular, 4 mm long. *Pappus* subuniseriate, reddish; setae numerous, ciliate, 12 mm long.

Distribution in the Malay Archipelago:

Sumatra: *Lampongs*, Kotta Djawa, Forbes 1402 (Br. M.).

Altitude: 90 m.

Moore placed this species in the section *Strobocalyx*; it seems preferable however, to accept it as a member of the section *Decaneurum* DC., on account of the 10-ribbed turbinate-linear achene.

As to Moore's suggestion: this species being conspecific with *Vernonia Moritziana* Sch.-Bip. (1854), there is no doubt whether these two species are quite different.

VII. Sectio **Congestae** nov. sect. (cf. note at base of p. 455).

Herbae pubescentes vel glabrae. *Folia* petiolata vel subsessilia, elliptica, rhomboidea-elliptica, obovato-elliptica vel in parte superiore deltoidea vel subrotundato-ovata, sensim attenuata in petiolum, apice acute acuminata vel obtusa et mucronata, serrata vel subintegra, subtus pilosa vel glabra, interdum glandulosa, pinninervia. *Capitula* glomerata, (5—30), glomerulis parvis, pedunculatis, sessilia vel subsessilia, minima, oblonga, 2—9-flora. Squamae *involucri* paucae vel plures, oblongae, apice acute acuminatae ad subrotundatae, pubescentia vel glabra. *Antherae* satis longe sagittatae, apice acutae. *Achenium* turbinatum vel oblongum, 3—4-angulatum, glabrum, dense glandulosum, rariter eglandulosum. *Pappus* biseriatus, albidus, setae serieri interioris caducae, exterioris applanatae, squamiformes, breves, persistentes. *Receptaculum* parvum.

Distribution: Islands to the south of Celebes, Timor, Soembawa.

Key to the species.

1\. a. Stem and leaves pubescent (or leaves villous); heads 2—5-flowered . . . 2
b. Stem and leaves very glabrous; leaves black-spotted; heads 7—9-flowered . . . (32) **V. actaea.**

2\. a. Heads 2—3-flowered . . . 3
b. Heads 5-flowered . . . (31) **V. capituliflora.**

3\. a. Heads 3-flowered; involucrum 3-seriate; scales about 12, inner ones 5, concave . . . (34) **V. timorensis.**
b. Heads 2-flowered; involucrum 2-seriate; scales about 6, inner ones 2, compressed . . . (33) **V. Walshae.**

(31) **Vernonia capituliflora** Miq.! Fl. Ind. Bat. II (1856) 19; Boerl. Fl. Ned. Ind. II (1899) 235; *Cyanopis microcephala* Sch.-Bip.

in ZOLL. Syst. Verz. Ind. Arch. (1854) 120 (nomen nudum) — Pl. I, *f*.

Erect herb, about 30 cm high (ex MIQUEL), branched; *stem* terete, grooved, scabridly pubescent. *Leaves* petiolate or subsessile (petioles 0.1—3 cm long), elliptic-oblong, long acuminate or acute at the top, gradually long attenuate into the petiole (not to be separated), mucronately serrate or subentire, membranous, pale greyish villous beneath, subglabrous above, pinni-nerved (lateral nerves 4—5 pairs); blades 2—10 cm long, ½—3½ cm broad; extreme ones smaller. *Heads* glomerate (15—30) at the top of peduncles (1—2½ cm long) in the axils of the upper leaves; heads small, subsessile, oblong, 5-flowered, 3½—4 mm long, 1—1½ mm wide. *Involucre* 3—4-seriate, oblong; scales about 15, villous, minutely glandular, ciliate at the edges (hairs rather long, slack), inner ones elliptic-oblong, sharply acuminate, 3-nerved, 3 mm long, outer ones linear, long and sharply acuminate at the top, subulate, 1-nerved, extreme ones 1 mm long. *Flowers* exserting the involucre. *Corolla* 5-lobed, 2—2½ mm long; tube very narrow, longer than the limb (1½ mm long); limb campanulate, lobes acute. *Style*-branches very short, acute at the top, pubescent; style sometimes undivided *Anthers* long sagittate at the base, acute at the top. *Achene* turbinate, 3- 4-angular, glabrous, densely glandular, less than 1 mm to ½ mm long. *Pappus* biseriate, whitish, inner row setaceous, shorter than the corolla, 1½ mm long, caducous, outer row consisting of flattened scale-like ciliated setae, much shorter, about ½ mm long, permanent *Receptacle* small, flat, alveolate.

Distribution in the Malay Archipelago:

Soembawa: Bima, Wooh Sahe, ZOLLINGER (det. MIQUEL) s.n. (U) — Dompoe, RENSCH s.n. (B).

Flowers bluish violet (RENSCH).
Hab.: in jungles; on a dry soil; rare.
Altitude:: 80 m.
Flowers: May, Aug.
Endemic.

MIQUEL placed this species in the section *Cyanopis*.

(32) **Vernonia actaea** KOSTER in Fedde Repert. XXXIV (1933) 4 — Pl. I, *f*; III, 36—37.

Herbaceous, much branched, 25—60 cm high; *stem* and *branches* terete, striate, glabrous (youngest parts pubescent), warty, pale green, sometimes purplish, 1½—3 mm thick; internodes 1—5 cm long. *Leaves* shortly petiolate or sessile (petioles 0—1 cm long, not clearly to be separated from the blades), narrowly elliptic-oblong, obovate-oblong, elliptic, long attenuate at the base, shortly narrowed, obtuse and mucronate at the top, pale green, entire or remotely mucronulate along the

margin, pinni-nerved (nerves prominent beneath; lateral ones 3—6 pairs; no reticulations), most probably fleshy, densely glandularly black-spotted and very glabrous at both sides (youngest leaves slightly pubescent), warty above, 3½—8 cm long, 1—2 cm broad. *Heads* glomerate (5—15 together) at the top of dichotomously branched axillar peduncles, small, oblong, shortly pedunculate (peduncles ½ mm long, 7—9-flowered, 4—5 mm long, 1½ mm wide). *Involucre* 4-seriate, oblong; scales oblong, concave, with membranous edges, entire or slightly serrate, glabrous or subglabrous, inner ones acute to nearly rounded and mucronate at the top, very glandular, 3-nerved, 3½—4 mm long, outer ones very small, acute at the top, with ciliate edges, ½ mm long. *Corolla* tubular, glabrous, 4 mm long, 5-lobed; lobes as long as the tube narrow, acute. *Anthers* long sagittate at the base, acute at the top. *Style* hirsute, branches acute. *Achene* 4-angular, oblong, attenuate at the base, glabrous, very glandular, 1½ mm long. *Pappus* biseriate; setae white or dirty white, ciliate, of the inner row 2—3 mm long, caducous, of the outer row small, flattened, scale-like. *Receptacle* small, alveolate, flat.

Distribution in the Malay Archipelago:

S a l e i e r, south, DOCTERS VAN LEEUWEN 1937 (B, U) — P. Bonerate, to the south of Saleier, DOCTERS VAN LEEUWEN 1423 (B, U) — P. Kajoeadi, to the south of Saleier, DOCTERS VAN LEEUWEN 1320 (B, U) — P. Passir Talloe, near Saleier, DOCTERS VAN LEEUWEN 1466 (B, U).

P. M o e n a, to the south-east of Celebes, KJELLBERG 120 (B).

T o e k a n g b e s i I s l a n d s, P. Bonongko, ELBERT 2569 (L).

T i m o e r l a o e t (Tanimbar Islands), RIEDEL s.n. (K).

Flowers violet (DOCTERS VAN LEEUWEN), white (id.); stem woody at the base (DOCTERS VAN LEEUWEN).

Hab.: on coral rocks near the sea, on sandy beaches, in jungles; on a dry soil.

Altitude: 0—5 m.

Flowers: Febr., May, June, July.

Its succulent leaves are easy to be explained by the dry or physiologically dry habitats.

This species is closely related to the preceding one, but the following differences are to be found:

Vernonia capituliflora has membranous, greyish felty leaves, long acuminate at the top; 15—30 heads clustering; sharply pointed, villous involucral scales and very small, 5-flowered heads.

In *Vernonia actaea* the leaves are most probably fleshy, they are obtuse and mucronate at the top, densely glandular; the heads in clusters of 5—15, are larger and 7—9-flowered; the involucral scales are very glandular and varying from nearly rounded to acute at the top, being always mucronate with membranous margins.

The specimens of this species have been collected near the sea coast, on rocks

or on the beach at about sea-level, those of *Vernonia capituliflora* on a dry soil, altitude 80 m.

(33) **Vernonia Walshae** nov. spec. — Pl. I, *f*; III, 39—42.

Herba parva, 11—18 cm longa, multo vel paulo ramosa; *ramis* simplicibus. *Radix* brevis, tenuis, simplex vel paulo ramosa. *Caulis* tenuis, obscuriter striatus, glandulosus, pubescens, (pilis albidis, satis longis) 1—2 mm crassus, internodiis ½—1½ cm longis. *Folia* alterna, subpetiolata, parva, membranacea, in parte superiore subrotundo-ovata vel deltoidea, apice acuta et mucronata, margine serrata, (dentibus acutis apice mucronulatis, curvatis), pinninervia (nervis lateralibus, 6, subtus prominentibus), utrinque sparse pubescentia (pilis curvatis, articulatis), parce glandulosa, 8—20 mm longa et lata; in parte inferiore abrupte et valde attenuata, integra, 1—3 cm longa, plusminusve 1 cm lata; folia superiora minora; folia ad basin saepe ramulo brevissimo praedita. *Capitula* glomerata, parva, (15—25); glomerulis pedunculatis, pedunculis tenuibus, 5—12 mm longis, basi folio parvo praeditis (parte superiore anguste ovata), ramulis glomerulorum brevissimis, bractaea lineari praeditis. *Capitula* sessilia vel subsessilia, tenuia, oblonga, 2-flora, 4½ longa. *Involucrum* biseriatum; squamis perpaucis, interioribus 2, subnavicularibus, purpurascentibus, pubescentibus (pilis appressis, nitidis, albidis), apice acute acuminatis et serratis, utrinque compressis, oblongis, 3 mm longis, minusquam 1 mm latis, exterioribus 3 vel 4, lanceolato-linearibus, apice subulatis, 1 mm longis, brevioribus. *Flores* bisexuales. *Corolla* anguste infundibuliformis, 3½ mm longa, 5-lobata, lobis lanceolatis, apice acutis et parce pilosis, 1 mm longis, tubo limbo subaequilongo. *Antherae* ad basin sagittatae, apice subacutae, filamento medio incurvato. *Stylus* bifurcatus; rami breves, acuti, lati, pubescentes. *Achenium* (immaturum) turbinatum, 4-angulatum, ½ mm longum, glabrum, glandulosum. *Pappus* biseriatus; setae seriei interioris caducae, paucae, ciliatae, albae, 1½ mm longae, exterioris squamiformes, minutae, applanatae, acutissimae, ciliatae. *Receptaculum* parvum.

Distribution in the Malay Archipelago:

Timor: South Central Timor, near Kaslioe, N. Moetis, WALSH 328 (B), type specimen.

Flowers dark violet (WALSH).
Hab.: on a sunny slope; rare.
Altitude: 1350 m.
Flowers: May.

This species is at once to be distinguished from *Vernonia capituliflora* by the 2-flowered heads, the boat-shaped 2 inner involucral scales and by the shape of the leaves.

(34) **Vernonia timorensis** nov. spec. — Pl. I, *f*; III, 38.

Herba, 70 cm longa, in parte superiore ramosa, in parte inferiore simplex et efoliata. *Caulis* multo striatus (striis prominentibus), sparse albide pubescens (pilis articulatis, nonnullis tenuibus brevioribus intermixtis), 2½ mm crassus, in parte inferiore sublaevus, subglaber, internodiis 2—6 cm longis. *Folia* alterna, subsessilia, rhomboideo-elliptica, apice longissime et acute acuminata; ad basin primo abrupte, demum sensim valde attenuata, dentata (dentibus longis vel longissimis, 1 ad 3 mm longis, 1 mm latis, apice mucronulatis; interdum nonnullis minimis acutis intermixtis), membranacea, pinninervia (nervis lateralibus circiter 12, subtus prominentibus; extremis obsoletis), supra sparse pubescentia (pilis albidis, tenuibus, nonnullis crassioribus articulatis intermixtis), subtus canescentia, sparse pubescentia; 4—9 cm longa, 1½—3½ cm lata; superiora minora et angustiora, ad 2 cm longa, 4 mm lata. *Capitula* glomerata, (10—20), glomerulis breviter vel longe pedunculatis, pedunculo tenui, incano-pubescenti, ½—3½ cm longo, in axillis foliorum superiorum vel terminali. *Capitula* sessilia, parva, oblonga, tenuia, 3-flora, 4 mm longa. *Involucrum* 3-seriatum; squamis glandulosis, parce pubescentibus vel subglabris, interioribus 5, concavis, oblongis, apice acute mucronulatis, 3½ mm longis, exterioribus sensim minoribus, 4—6, subulatis, parce pubescentibus vel subglabris. *Flores* bisexuales. *Corolla* anguste infundibuliformis, 5-lobata, 3 mm longa, lobis lanceolatis, apice subacutis, glabris, 1½ mm longis. *Antherae* ad basin sagittatae, apice acutae breviter acuminatae. *Stylus* bifurcatus; *rami* pubescentes, acuti. *Achenium* (immaturum), turbinatum, glabrum, (pars superior breviter pubescens) eglandulosum, plusquam ½ mm longum. *Pappus* biseriatus; setae interiores paucae, ciliatae, 2 mm longae, caducae, exteriores squamiformes, applanatae, minutae, ciliatae. *Receptaculum* parvum.

Distribution in the Malay Archipelago:

T i m o r: North Central Timor, Soepa, Beboki, WALSH 409 (B), type specimen.

Altitude: 600 m.

Flowers: June.

This *Vernonia* is closely related to the preceding species; it is different by the 3-flowered heads, the involucre and the shape of the leaves. *Vernonia capituliflora* is different by the 5-flowered heads, the villous, minutely dentate, elliptic-oblong leaves and the villous involucral scales.

Note: *Vernonia actaea, Vernonia capituliflora, Vernonia Walshae, Vernonia timorensis* are quite different from the other *Vernonias*; at the same time they are very closely allied to each other. So it seems preferable to put them to a separate section, for which I propose the name „*Congestae*”.

II. LYCHNOPHORINAE HOFFMANN in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 121, 128 — *Lychnophoreae* BENTH. et HOOK. Gen. Pl. II (1873—1876) 165, 171.

Heads clustered to heads of second order; heads 1- to few-flowered. Nearly all in trop. America.

Key to the genera.

1. a. Heads 4-flowered 2
   b. Heads 1-flowered . . . . 7. **Rolandra**, p. 467
2. a. Glomerules on long peduncles . . . . 5. **Elephantopus**, p. 456
   b. Glomerules sessile, spicate . . . . . 6 **Pseudelephantopus**, p. 465

5. ELEPHANTOPUS.

ELEPHANTOPUS L. Gen. Pl. ed. I (1737) 249; BL. Bijdr. (1825) 890; LESS. in Linnaea IV (1829) 323; LESS. Syn. (1832) 149; ROXB. Fl. Ind. III (1832) 445; DC. Prod. V (1836) 85; MIQ. Fl. Ind. Bat. II (1856) 21; BENTH. Fl. Austr. III (1866) 461; BENTH. et HOOK. Gen. Pl. II (1873—1876) 237; CLARKE Comp. Ind. (1876) iii; OLIVER Fl. trop. Afr. III (1877) 298; HOOK. Fl. Br. Ind. III (1882) 242; BAILLON Hist. Pl. VIII (1886) 126; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 130; TRIMEN Fl. Ceylon III (1895) 95; BOERL. Fl. Ned. Ind. II (1899) 173; GLEASON in Bull. N.Y. Bot. Gard. IV (1905—1907) 239; ELMER Leafl. Phil. Bot. 1 (1906) 95, KING et GAMBLE in Journ. As. Soc. Beng. LXXIV (1910) 27; KOORDERS Exc. Fl. Java III (1912) 316; RIDLEY Fl. Mal. Penins. II (1923) 180; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 502; LEMÉE Dict. Genr. II (1930) 820; *Pseudelephantopus* ROHR Skrivt. Nat. Selsk. Kiob. II (1792) 213; GLEASON in Bull. N.Y. Bot. Gard. IV (1905—1907) 242, *Distreptus* CASS. Bull. Soc. Phil. (1817) 66; CASS. Dict. Sci. Nat. XIII (1819) 366.

Perennial, pilose, rigid herbs. *Leaves* sessile, entire or dentate, pinninerved. *Heads* few-flowered, in glomerules, surrounded by leaflike bracts. *Glomerules* on rigid peduncles. *Involucre* cylindric, compressed, biseriate, rows alternating; scales few, oblong, acute at the top. *Corolla* tubular, 5-fid, often deeper cleft on one side. *Anthers* appendiculate; basal auricles obtuse. *Style*-branches filiform, pilose, subulate at the top. *Achene* oblong, 10-ribbed, pilose. *Pappus* uniseriate; hairs few. *Receptacle* small, naked flat or nearly so. Occasionally the seeds germinate in the heads (BOERLAGE l.c.).

About 32 species, of which 25 in America (Texas!, Kentucky!, Missouri!, Mexico and all South America!); 5 species in trop. Africa

(Angola!) and Madagascar!; 2 species in trop. Asia (see distribution of *E. scaber*), of which one also in Australia and trop. Africa.

Key to the species.

1. a. Head-glomerules 1 cm long or longer; scales of the involucre with long, mostly spreading hairs; corolla 7—9 mm long; achene 4 mm long; setae of the pappus gradually dilate and pilose at the margin. Leaves spathulate, in a radical rosette, as a rule, obtuse at the top; hairs rigid, appressed, grey, most densely inserted on the principal nerves beneath . . (1) **E. scaber.**
   b. Head-glomerules 1 cm high or shorter; scales of the involucre subglabrous; corolla 5 mm long; achene 2½—3 mm long; setae of the pappus abruptly deltoid and subglabrous at the base. Leaves elliptic, acute at the top, scattered along the stem; hairs velvety silvery, equally densely inserted beneath . . . . (2) **E. tomentosus.**

(1) **Elephantopus scaber** L. Sp. Pl. ed. I (1753) 814.

Perennial rigid herb, 10—70 cm high. Creeping *root-stock* thick, having many roots, branched or simple. One to three stems arising from the base, distinctly dichotomous, terete, smooth or slightly ribbed, warty, densely strigosely hairy (hairs about 1 mm long, whitish, more or less appressed), 3—6 mm thick; internodes 5—13 cm long. *Leaves* paler beneath; radical ones numerous, forming a rosette, subsessile, variable subobtuse or nearly rounded, shortly acuminate at the top, gradually attenuate at the base (rarely attenuate into a long petiole, to 5 cm long), semiamplexicaul, pinni-nerved (nerves more or less prominent beneath, lateral ones 7—13 pairs, reticulations hardly visible), sparingly spreaded-hairy (hairs scabrid, erect) or subglabrous, warty above, scabridly greyish pubescent (hairs appressed, rigid, most numerous and longer on the principal nerves), densely glandular, greyish beneath, chartaceous or coriaceous, 5—38 cm long, 1—6 cm broad. Leaves of the stem of the flowering branches few or none, some higher ones sometimes small, much reduced, sessile, narrowly oblong, ovate or obovate, other leaves of the stem sessile, narrowly oblong, serrate or repandate or nearly entire, gradually attenuate at the base, acute at the top, often small, 3—15 cm long, 2—30 mm broad. Leaves of the non-flowering branches scattered along the stem, semiamplexicaul, for the rest like the radical ones of the flowering branches. *Heads* glomerate (exterior heads younger), about 20—50 together; glomerules single or double, on long dichotomous rigid peduncles (1—2 mm thick, 4—21 cm long with scabrid appressed whitish hairs), 1—1½ cm high, 1½—2½ cm broad, bearing at the base 3 cordate or deltoid-ovate, serrate, small leaves (1—2½ mm long, 8—15 mm broad, acuminate at the top; nerves prominent) pilose at both

sides, exceeding the glomerules or as long as the glomerules. *Glomerules* surrounded by a row of boat-shaped, long and very sharply acuminate scales; scales 7 mm long, 1-nerved having many long spreading grey hairs on the stout nerve. *Heads* oblong, 4-flowered, 8—10 mm long, 2 mm thick. *Involucre* biseriate; scales of the inner row 4, narrowly oblong, very acute at the top, 3-nerved, densely hirsute (hairs more or less spreading, grey, long), slightly glandular, 1 cm long; of the inner row 4, lanceolate, very acute at the top, submembranous, subglabrous, thinly hirsute, 5 mm long, alternating with the inner row. *Corolla* infundibuliform, 5-lobed, 7—9 mm long; lobes subobtuse, lanceolate, glabrous, 2—3 mm long. *Anthers* shortly sagittate at the base, subobtuse at the top, small. *Style* hairy at the upper part; branches subobtuse at the top, pubescent. *Achene* oblong-linear, clearly ribbed (ribs about 10), pubescent between the ribs, pale coloured, 4 mm long, ½ mm wide. *Pappus* existing of 5, rarely 6, spreading stiff bristles, gradually triangularly dilate and hairy at the base, 5 mm long. *Receptacle* flat, minute.

Distribution: Br. India, Mal. Penins., Indo-China, S. China, Formosa, Philippines, Mal. Arch., Australia, trop. Africa.

1. var **typicus**; *Elephantopus scaber* L. Sp. Pl. ed. I (1753) 814; L. Sp. Pl. ed. II (1763) 1313; BURM. Fl. Ind. (1768) 185; WILLD. Sp. Pl. III (1804) 2386; LESS. in Linnaea IV (1829) 325; ROXB. Fl. Ind. III (1832) 445; WIGHT Contr. Bot. Ind. (1834) 8; WIGHT! Ic. (1840) t. 1068; DC.! Prod. V (1836) 86; ZOLL. in Nat. Gen. Neêrl. Ind. II (1845) 224; MIQ.! Pl. Jungh. (1854) 496; MIQ.! Fl. Ind. Bat. II (1856) 21; BENTH. Fl. Hongkong. (1861) 170 (excl. syn.); MIQ. Sumatra (1862) 210; BENTH.! Fl. Austr. III (1866) 461; CLARKE Comp. Ind. (1876) 28; KURZ in Journ. As. Soc. Beng. XLVI 2 (1877) 198, HOOK. Fl. Br. Ind. III (1882) 242; FORBES et HEMSLEY in Journ. Linn Soc. Bot. XXIII (1886—1888) 402; TRIMEN Fl. Ceylon III (1895) 12; BOERL. Fl. Ned. Ind. II (1899) 173, 235; CLARKE in Bot. Tiddskr. XXIV (1902) 243; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV 2 (1905) 28; GLEASON in Bull. N. Y. Bot. Gard. IV (1906) 241; ELMER Leafl. Phil. Bot. I (1906) 97; MATSUMURA et HAYATA in Journ. Sci. Tokyo XXII (1906) 202; KOORDERS! Exc. Fl. Java III (1912) 316; GIBBS in Journ. Linn. Soc. XLII (1914) 97; MERRILL in Journ. R. As. Soc. (1921) 586; GAMBLE Fl. Madras IV (1921) 676; RIDLEY Fl. Mal. Penins. II (1923) 180; MERRILL Enum. III (1923) 596; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 502; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1430; BACKER Handb. Suikerr. Java VII (1932) 753; KOSTER in Fedde Repert. XXXIV (1933) 6; HOCHREUTINER in Candollea V (1931—1934) 298.

Radical *leaves* spathulate-oblong or spathulate-obovate, crenate-serrate (teeth on equal distances, directed forward, rounded at one side), scabridly greyish pubescent beneath, 5—17 cm long, 1—3½ cm broad.

Distribution in the Malay Archipelago:

Sumatra: *East Coast*: Karo-plateau, LÖRZING 8805 (B); *Tapanoeli*: Pangoeroeron, on P. Samosir in the lake of Toba, LÖRZING 7643 (B); *West Coast*: Fort van der Capellen, MATTHEW s.n. (K) — Taloe, BÜNNEMEYER 60 (B) — Koerintji, BÜNNEMEYER 7945 (B); *Djambi*: Djambi, POSTHUMUS 805 (L, B); *Palembang*: Palembang, DE VOOGD s.n. (B); Sumatra, coll. unknown (B).

Riouw Arch.: *P. Karimon*, G. Djantan, BÜNNEMEYER 7868 (L) — P. *Bintan*, Batoe hitam, BÜNNEMEYER 6404 (L).

Bangka: Muntok, AMAND 38 (U).

Java: *West Java*: Tjiastana, Priangan, BAKHUIZEN VAN DEN BRINK 5056 (B) — Tjadas Malang near Tjibeber, BAKHUIZEN VAN DEN BRINK 457 (L), WINCKEL 1541 (L, B) — near Tjibeber, WINCKEL 1165 (B) — Batavia, RAYNAUD s.n. (L), RAAP 2424 (L), WINTERSBOTTOM s.n. (K), BACKER s.n. (L) — Tjigentjah near Tjisalak, Priangan, BAKHUIZEN VAN DEN BRINK 5072 (L) — G. Goentoer, KOENS 155 (B) — G. Poetri near Garoet, KOENS 107 (B) — between Kali Poetjang and Pada Herang, Priangan, BACKER 4513 (B) — near Buitenzorg, BACKER 6244 (B), HALLIER 157c (L) — Batavia VAN DER VEEN s.n. (L) — between Lengkong and Tjitjoeroek, Priangan, BACKER 17148 (B) — Halimoen, estate, Priangan, coll. unknown 24 (B) — between Tji Sandawoet and Tjatjaban, Priangan, BACKER 12181 (B) — Tji Seroepan, Priangan, KOENS 488 (B) — Telaga Bodas, KOENS 277 (B) — Noesa gede in the lake of Pendjaloe, KOORDERS 47992 (B), 47993 (B) — Sindanglaya, BACKER 21511 (B) — Depok, KOORDERS 31298 (B); *Middle Java*: Karangasam, Semarang. KOORDERS 28466 (L) — G. Moeriah, DOCTERS VAN LEEUWEN—REYNVAAN 822 (U), 880 (B) — Kedoengdjati, KOORDERS 1896 (L) — north of Josoredjo, Pekalongan, BACKER 16196 (B) — Kendal, BACKER 16355 (B) — Poerworedjo, LEEFMANS s.n. (B) — Poerwokerto, BACKER 54 (B); *East Java*: Poeger, KOORDERS 20565 (L) — G. Baloeran, foot, BACKER 24829 (B) — between Sripit and Prigi, Kediri, BACKER 11758 (B) — S.-Kediri, BEUMÉE 2366 (B) — G. Tengger, MOUSSET 73 (B), BUIJSMAN s.n. (U) — near Blora, BLOKHUIS s.n. (B) — G. Idjen, BACKER 25346 (B), 24868 (B) — Pradjekan, Bondowoso, BACKER 24529 (B) Pantjoer ner Sitoebondo, OTTOLANDER 325 (B).

Madoera: Batang batang daja, BACKER 20890 (B).

Kangean Arch.: *P. Kangean*, Sawah Soemoer, DOMMERS 139 (B) — *P. Paliat*, BACKER 29328 (B).

Soembawa: Wawa, RENSCH 887 (B).

Timor: Koepang, TEYSMANN s.n. (B) — N. Moetis, Kaslioe, WALSH 332 (B).

Wetar: plateau of Mangowe, near Laswerang, ELBERT 4511 (L).

Borneo: Sandakan and vicinity, RAMOS 1823 (B).

Celebes: *Manado*: Manado, KOORDERS 16437 (B); *S.W. Celebes*: Lombasang, BÜNNEMEYER 11349 (B) — Bonto Parang, BÜNNEMEYER 10697 (B).

Flowers purple (KOORDERS, a.o.), white (WALSH), white and crimson (RENSCH), mostly reddish purple, sometimes white (BACKER), white to very pale violet, lobes pale violet (BAKHUIZEN VAN DEN BRINK); anthers and style white, branches of the style pale violet (BAKHUIZEN VAN DEN BRINK). The flowers open between 1 and 2 p.m. (BLOKHUIS) and close at about 5 p.m. (BACKER). A depauperate form has been collected, having very small leaves (3 cm long, 0.8 mm broad) and one very shortly petiolate glomerule.

Vernacular names: *tapak liman, djoekoet tangkoer, tjangtjan, boenga tajajam, lolat male, tjengtjeng, semboeng lempah, balagadoek, oempang* (all Java), *tampak dengdeng, tampak tanah* (all Kangean Arch.), *tampa tampa hullang, daoen saoe saoe boemi, ti marpira pira* (all Sumatra), *toetoep boemi* (Borneo), *roempoet petje* (Celebes).

Hab.: in teak, bamboo, Eucalyptus and other forests, in jungles, in grassy fields, along waysides, in a dry rice field, in a neglected garden, on a lava-stream (one of the first plants on the lava); on volcanic sand, sandy clay and marly lime; in sunny or rather shady places (ex BACKER l.c.); common, mostly numerous.

Altitude: 0—1500 m.

Flowers during the whole year.

Medical use: roots against malarial fever (HEYNE), decoction of the roots against bowel complaints (acc. to MIQUEL).

Distribution: South Asia: Madras (Malabar!, Calicut-district!, Courtalam!, Terr. Canara!, Nillgherry!), Bombay!, Bengal!, Nepal!, Himalaya!, Assam! (Khasia!), Burma!, Malay Peninsula!, Annam!, Cochinchina!, Tonking!, Laos, Cambodge; China (Yunnan!, Fukien!, Foochow!, Chekiang!, Kwantung, Hongkong!); Formosa, Philippines (Luzon!, Mindoro); Australia!, Trop. Africa!

Though this species usually has been considered to be pantropical (BENTHAM l.c., FORBES and HEMSLEY l.c., HOFFMANN l.c., RIDLEY l.c., MERRILL l.c.), this view does not seem to be correct. The species has not been mentioned in the Flora Brasiliensis and nor in the Kew Herbarium, nor in the Leiden Herbarium any specimen of this species is to be found. In many cases *Elephantopus scaber* must have been confounded with the very closely related tropical american *Elephantopus tomentosus* and *Elephantopus carolinianus*; the last species differs from Elephantopus scaber by its elliptic leaves, scattered along the stem, its smaller glomerules, its glabrous involucral scales, its long hairs (about 1 mm long) sparingly equally distributed on the lower surface of the leaves. According to TORREY and GRAY (Fl. N. Am. II, 1838—1840, 61) *Elephantopus scaber* has been collected once in Louisiana;

no differences have been found after comparing it with specimens from China and the Malay Peninsula. GLEASON l.c. seems to have the right view in considering the species concerned to be distributed in the tropics of the Old World and sparingly introduced into the West Indies, Central America and South America.

It is not certain, whether this species occurs in Madagascar; according to the description of HUMBERT (Comp. Madagascar., 1923, 32) the species concerned seems to be *Elephantopus tomentosus*.

BACKER l.c. suggests this species to be introduced from tropical America, being collected in Java since 1858. Being indigenous, however, it may have been immigrated in Java from the Malay Peninsula.

MERRILL l.c. is convinced that *Elephantopus scaber* is introduced into the Philippines.

2. var. **sinuatus** MIQ.! Pl. Jungh. (1854) 496; MIQ.! Fl. Ind. Bat. II (1856) 22; *Elephantopus sinuatus* ZOLL. et MOR. in Syst. Verz. Ind. Arch. (1854) 120; *Elephantopus scaber* BL.! Bijdr. (1825) 890; LESS. in Linnaea IV (1829) 325; DECAISNE Herb. Timor. (1835) 81.

Radical *leaves* often large, spathulate, narrowed into a winged petiole, often elongated, undulate-runcinate, thinly pilose beneath except on the principal nerves, 6—38 cm long, 2—6 cm broad; teeth of the margin on irregular distances.

In this variety two forms are to be distinguished: the form which MIQUEL describes is rather an intermediate form between the two extreme ones.

α. The dentation of the radical leaves is scarce; the teeth of the margins are small and acute (½ mm long).

Distribution in the Malay Archipelago:

Sumatra: *East Coast*: Medan, LÖRZING 4101 (B) — Sebaoek, Bengkalis, BEGUIN 404 (L, B) — Asahan, BARTLETT and LA RUE 332 (L).

Java: *West Java*: Buitenzorg, HALLIER 157c (B) — Palaboean, KOORDERS 34649 (B); *Middle Java*: East Tegal, BEUMÉE 3694 (B) — Goendik, Blora, BACKER 6446 (B).

Madoera: Bangkalan, BACKER 19069 (B).

Flores: Endeh, RENSCH 1030 (B).

Celebes: South West, Lombasang, BÜNNEMEYER 11678 (L).

Moluccas: *Amboina*, WEBB s.n. (K) — *Banda Islands*: MOSELY s.n. (K).

β. The incision of the radical leaves reaches nearly half the breadth of the leaf; the teeth of the margin are different in shape; they are obtuse, deltoid and often large (to ½ mm long), or small and acute (½ mm long).

Distribution in the Malay Archipelago:

Java: *West Java*: Batavia, VORDERMAN s.n. (B), BACKER s.n. (B)

— Depok, DE MONCHY and BURCK s.n. (B) — Poerwakarta, BACKER 13760 (B); *East Java*: Bondowoso, ETTY s.n. (B).

Moluccas: *Amboina*: ROBINSON 1842 (L).

Kangean Arch.: *P. Kangean*, Kajoe waroe, BACKER 2810 (B) — *P. Saoebi*, BACKER 28282 (B) — *P. Saboenten*, BACKER 29644 (B).

The following specimens could not be inserted in either of the forms mentioned, like that described by MIQUEL.

Distribution in the Malay Archipelago:

Sumatra: *Atjeh*: Alas-valley, near Koeta ajane, LÖRZING 11076 (B); *Tapanoeli*: Ankola, JUNGHUHN 303 (L), det. MIQ. — near the lake of Toba, LÖRZING 6422 (B); *West Coast*: Priaman, TEYSMANN 1042 (B) — Pladang, coll. 213 (B); Sumatra, CUMING 2428 (K).

Lingga Arch.: *P. Lingga*, Merawang, BÜNEMEYER 6813 (B).

Riouw Arch.: *P. Bintan*, BÜNNEMEYER 6326 (B) — *P. Sedanan*, VAN STEENIS 1071 (B).

Java: *West Java*: Buitenzorg, HALLIER 157 (L, B), 157b (L), BACKER 5805 (B), KOORDERS 32616 (B) — between Rangkasbitoeng and Tjileles, BACKER 1096 (B) — between Panjawoengan and Bajah, BACKER 1564 (B) — Moentjang, Bantam, BACKER 1876 (B) — between G. Kentjana and G. Kendeng, BACKER 1290 (B) — Rangkasbitoeng, BACKER 1010 (B) — Batavia, KOORDERS 32663 (B), BACKER 3362 (B), 3363 (B), 3364 (B), 3365 (B) — Tjiloa, Priangan, BACKER 25625 (B) — Tjiandjoer, Priangan, BACKER 3020 (B) — Wanajasa, Krawang, BACKER 14265 (B) — Soekaboemi, BACKER 14551 (B) — north of Kiara Pajoeng, Priangan, BACKER 23913 (B) — Tjileungsie and Klappamoengal, Buitenzorg, FRIJLINCK 15 (B) — east of Poerwakarta, HARMSEN 75 (B) — Tjiseëng, Buitenzorg, BAKHUIZEN VAN DEN BRINK 7930 (B) — G. Tjerimai, BACKER 4989 (B); *Middle Java*: Pekalongan, BACKER 15467 (B) — Margasari, Tegal, BEUMÉE 378 (B) — between Doro and Bandar, Pekalongan, BACKER 15614 (B) — Tegal, BACKER 15235 (B) — between Slawi and Balapoelang, Tegal, BACKER 15395 (B) — between Madjenang and Tji Salak, BACKER 18474 (B) — Randoe Blatoeng, Blora, BACKER 6600 (B) — Grobogan, South Kradenan, DE BOER 3 (B) — Kedoengdjati, KOORDERS 25136 (B) — Djapara, Ngarengan, KOORDERS 33501 (B), 33491, 34920 (B) — Nanas, Rembang, BEUMÉE 885 (B) — Regaloh, Semarang, BEUMÉE 3958 (B) — Banteran, Banjoemas, ROELOFSEN 12 (B) — Semarang, KOORDERS 28014 (L) — Ngandang, Rembang, KOORDERS 36144 (B, L) — Salatiga, DOCTERS VAN LEEUWEN—REYNVAAN s.n. (U) — Manggar Koedoes, BEUMÉE 5416 (B) — Koendoeran, Blora, BEUMÉE 5227 (B) — Karanganjar, KOORDERS 26224 (B) — Sepakoeng, Semarang, KOORDERS 35907

(B); *Djocjakarta*: Wonosari, BACKER 2583 (B); *Soerakarta*: Modjosragen, BACKER 8416 (B) — Klaten, ADMIN. GEMAMPIR 7 (B); *East Java*: Ngebel, Madioen, KOORDERS 29236 (B), 23175 (B) — res. Soerabaja, south, BEUMÉE 2432 (B) — Modjokerto, METSELAAR s.n. (B) — Manjoel, Madioen, STOUTJESDIJK 60 (B) — near Bodok, Kediri, KOORDERS 22872 (B) — Toeloengagoeng, BACKER 11701 (B) — Poenten, Malang, HOFSTEE 4 (B), LEEFMANS s.n. (B) — Poeger, BACKER 17779 (B) — Kepandjen, ISMAIL 22 (B) — G. Argopoero, BACKER 13216 (B) — Tarokan, BEUMÉE 2788 (B) — Dampit, BACKER 3799 (B) — near Soember Poetjong, BEUMÉE 2848 (B) — Djember, ULTÉE s.n. (B); Java, ZOLLINGER 7 (L, K).

Madoera: S.W. of Soemenep, BACKER 20629 (B) — Ketapang daja, BACKER 19856 (L, B) — Sampang, BACKER 19690 (L, B).

Kangean Arch.: *P. Kangean*, BACKER 26984 (B) — *P. Sepapan*, BACKER 28490 (B) — *P. Sepandjang*, BACKER 28785 (B).

Bali: Boeleleng, ROBINSON 2522 (B).

Timor: Soë, South Central Timor, WALSH 101 (B) — Timor, DECAISNE s.n. (L), WALSH s.n. (B).

Borneo: *West Borneo*: Mengkatja, DE MOL 144 (B); *S.E. Borneo*: Banjermasin, MOTLEY s.n. (K).

Celebes: *S.W. Celebes*, near Tanette, BÜNNEMEYER 12439 (B), 12515 (B).

Saleier: DOCTERS VAN LEEUWEN 1701 (B).

Moluccas: *Ternate*, near Fort Oranje, BEGUIN 796 (B); *Amboina*, ROBINSON 1842 (B).

Hab: in teak, bamboo and other forests, in grassy fields, along waysides, on a dry rice field, in coconut-gardens, on a railway-embankment, on the dikes of fish-ponds; on limestone, clay and volcanic sand; as a rule, abundant; very common.

Altitude: 1—1000 m.

Flowers during the whole year.

Distribution: Siam! Philippines (Luzon!).

BLUME's and DECAISNE's descriptions of *Elephantopus scaber* seem to refer to this variety *sinuatus*.

The chief distribution of this variety is the Malay Archipelago.

3. var. **angustatus** nov. var.

Folia radicalia oblanceolato-spathulata, elongata, subintegra, nervis marginibusque pubescentibus, 9—17 cm longa, 1½—2½ cm lata. Bracteae glomerulorum breves, 8—10 mm longae. *Glomeruli* parvi, 8—10 mm longi. Lobi *corollae* angustissimi.

Distribution in the Malay Archipelago:

Borneo: Sandakan and vicinity, RAMOS 1823 (L), type specimen.

4. var. **serratus** nov. var.

Rami dense, longiter et rigide pilosi. *Folia* radicalia anguste elliptico-obovata, acutissime serrata, 6—9 cm longa, 1—3½ cm lata, subtus nervi marginibusque pilosis. *Glomeruli* parvi, 1 cm longi, 1.2—1.5 cm lati. *Corolla* 6 mm longa, lobis 1½ mm longis. *Achenium* 3½ mm longum. *Pappi* setae 4 mm longae.

Distribution in the Malay Archipelago:

Riouw Arch.: *P. Papan*, BÜNNEMEYER 7796 (L).

Lingga Arch.: *P. Sinkep*, BÜNNEMEYER 7295 (L), type specimen.

Altitude: 10—15 m.

Flowers: Aug., Sept.

(2) **Elephantopus tomentosus** L. Sp. Pl. ed. I (1753) 814, ed. II (1763) 1314; WILLD. Sp. Pl. III (1804) 2390; LESS. in Linnaea IV (1829) 326; SCH.-BIP.! in Linnaea XX (1847) 516; GLEASON in Bull. N. Y. Bot. Gard. IV (1906) 241; RIDLEY Fl. Mal. Penins. II (1923) 180; *Elephantopus mollis* H. B. K. (ex. SCH.-BIP. l.c.) Nov. Gen. IV (1820) 26; DC. Prod. V (1836) 86; ELMER Leafl. Phil. Bot. I (1906) 97; MERRILL in Journ. R. As. Soc. (1921) 586; MERRILL Enum. III (1923) 595; *Elephantopus Martii* GRAH. (ex SCH.-BIP. l.c.) in Edinb. New Phil. Journ. (1830) 2; DC. Prod. V (1836) 86; HASSKARL Cat. II Hort. Bog. (1844) 96; *Elephantopus scaber* L. var. *Martii* MIQ. Fl. Ind. Bat. II (1856) 22; *Elephantopus scaber* L. var. *tomentosus* BAKER Fl. Bras. VI 2 (1873—1876) 173.

Perennial, large herb, up to 2 m high. *Stem* elongated, much branched, terete, ribbed, pilose (hairs whitish, 1 mm long, spreading), glandular, 3 mm thick at the upper part; internodes 1—9 cm long; ramifications indistinctly dichotomously branched; younger parts yellowish densely hairy. *Leaves* scattered along the stem; serrate (teeth directed forward, mucronate), or subentire, acute at the top, equally velvety silvery tomentose (hairs suberect), glandular, beneath, subglabrous, rugose above, pinni-nerved (6—15 lateral nerves, smaller nerves prominent beneath), chartaceous; lower ones oblong-obovate, narrowed into a winged petiole, ending into a dilate, triangular base, to 22 cm long, to 7 cm broad; higher ones elliptic or oblong-elliptic smaller (7—8 cm long, 1½ cm broad), subsessile or petiolate (petioles 2—3½ cm long), slightly greyish pubescent, warty above; highest ones very small, 3 cm long, 6 mm broad. *Heads* glomerate, 12—20 together; glomerules having 3 cordate leaves at the base (7—12 mm broad, 8—15 mm long, sometimes exceeding, but mostly not exceeding the heads), on long, slender peduncles (densely fulvously hairy, glandular, 1—6 cm long, ½ mm thick), 8—10 mm high,

$1\frac{1}{2}$—2 cm wide, consisting of 12—20 heads (exterior heads younger), surrounded by a row of boat-shaped long, sharply acuminate, 1-nerved scales (5 mm long, having few long hairs on the nerve). Heads oblong, small, 4-flowered. *Involucrtd* biseriate; scales of the outer row 4, lanceolate-oblong, very pointed at the top, 1-nerved, keeled, subglabrous, or glabrous, 4—5 mm long, alternating with the inner row; scales of the inner row 4, elliptic-oblong, boat-shaped, acute at the top, 3-nerved, slightly shortly pubescent (hairs appressed), glandular, 7—8 mm long. *Corolla* infundibuliform, 5-lobed, 5 mm long; lower part filiform; lobes lanceolate, glabrous, subobtuse at the top, $1\frac{1}{2}$ mm long. ***Anthers*** sagittate at the base. *Style*-branches slender, shortly pubescent. *Achene* oblong-linear, clearly ribbed (ribs 10) prominent, pubescent between the ribs, 3 mm long, $\frac{1}{2}$ mm wide. *Pappus*-bristles stiff, filiform, suddenly deltoid at the base, subglabrous at the lower part, 4 mm long. *Receptacle* flat, minute.

Distribution in the Malay Archipelago:

Borneo: *Br. N. Borneo*, Sandakan, Bur. Sci. Manila 783 (L); *Br. N. Borneo*, CREAGH s.n. (K).

Celebes: *Manado*, Tondano, WISSE 29 (B) — near Amoerang, KOORDERS 16435 (L) — Ratahan, KOORDERS 16438 (L), LAM 2414 (B) — near Manado, KOORDERS 16439 (L) — G. Sapoetan, STEUP 54 (L) — Minahassa, KOORDERS 16436 (L), HOSE 797 (K); *S.E. Celebes*: Kendari, KJELLBERG 354 (L) — id., Liasa, KJELLBERG 2252 (B).

Flowers white (KOORDERS a.o.); herb $1\frac{1}{2}$ m high (LAM).

Vernacular name: *soewoea* (Celebes).

Hab.: in primeval forests, along waysides, in coconut-gardens, on a damp bank of a brook; in the Minahassa very common, many together.

Atltitude: 0—700 m.

Flowers: Jan.—April, July—Sept., Nov.

Distribution: Central (Mexico!) and South America (Brazil!, Colombia!, Venezuela!, Guyana!, West Indies!, Bolivia!, Guatemala!, Peruvia!, Paraguay!), Africa!, Madagascar!, Seychelles!, Mascarenes!, Marianne Islands, Caroline Islands, Formosa, Philippines (Luzon!, Palawan!, Mindoro!, Culion!, Mindanao), Mal. Penins.!, New Caledonia!

6. PSEUDELEPHANTOPUS.

PSEUDELEPHANTOPUS ROHR in Skrivit. Nat. Selsk. Kiob. II (1792) 213; GLEASON Bull. N. Y. Bot. Gard. IV (1906) 242; *Distreptus* CASS. Bull. Soc. Phil. (1817) 66; CASS. Dict. Sci. Nat. XIII (1819) 366.

Probably one species in Central and South America. According to GLEASON l.c. a second species may belong to the genus.

(1) **Pseudelephantopus spicatus** (JUSS.) ROHR in Skrivt. Nat. Selsk.

Kioh. II (1792) 213; GLEASON in Bull. N. Y. Bot. Gard. IV (1906) 242; STANDEY in Contr. U. S. Nat. Herb. XXVII (1928) 376; *Elephantopus spicatus* JUSS.! in AUBL. Pl. Guian. II (1775) 808; BAKER in Fl. Bras. VI 2 (1873—1876) 177; ELMER Leafl. Phil. Bot. I (1906) 96; MATSUMURA et HAYATA in Journ. Sci. Tokyo XXII (1906) 202; MERRILL Enum. III (1923) 596; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 502; BACKER Handb. Suikerr. VII (1932) 754; *Distreptus spicatus* CASS. in Dict. Sci. Nat. XIII (1819) 367; LESS. in Linnaea IV (1829) 328; DC. Prod. V (1836) 87.

Large herb, 60—100 cm high, much branched; *stem* glabrous or sparingly hirsute, terete at the top, subangular, sparingly glandular, 3—10 mm thick at the base; branches terete, zigzag, striate, glandular; internodes clearly limited by the cicatrices of the dropped leaves, 2—3½ cm long. *Leaves* subsessile, subamplexicaul, entire or distantly serrate, pinni-nerved (8—11 nerves at each side), glossy, spreaded-scabridly pubescent or subglabrous, glandularly spotted above, slightly scabridly pubescent (especially on the nerves) or subglabrous, densely glandular beneath; lower ones spathulate-oblong, gradually narrowed, triangularly dilate to the base, subobtuse or shortly acute at the top; superior ones lanceolate-elliptic, gradually narrowed at both ends; lower ones 7—20 cm long, 1—5 cm broad; higher ones 2½—11½ cm long, ½—1½ cm broad. *Glomerules* sessile, spicate, consisting of 1—6 heads in the axil of a small lanceolate leaf (about as long as or longer than the heads); spikes terminal, narrow, elongated. *Heads* oblong, slightly compressed, 4-flowered, 10—12 cm long, 4 mm wide. *Involucre* about as long as the heads, 4-seriate; each row consisting of 2 opposite scales, gradually shorter to the exterior ones, scales glabrous, elliptic-oblong, shortly acuminate and acute at the top, one-nerved, dark coloured and glandular at the upper part, 1 cm long, 2 mm wide; midrib prominent, edges scarious, white. *Corolla* subtubular, 5-lobed, 7 mm long; lobes lanceolate, subobtuse at the top, long, glabrous; limb gradually attenuate into the slender, striped tube. *Anthers* shortly sagittate at the base; tip short, subobtuse. *Style*-branches slender. *Achenes* linear-oblong, ribbed, densely tomentose, glandular between the ribs, 6 mm long. *Pappus* 4 mm long, consisting of 2 long bristles, looped at the top, and about 7 smaller straight ones, inequally long, all scabrid. *Receptacle*, small.

Distribution in the Malay Archipelago:

Java: *West Java*: Buitenzorg, BAKHUIZEN VAN DEN BRINK 1934 (L, K) — id., Herbarium, VAN STEENIS 1804 (B) — Meester Cornelis, WEEHUIZEN 1 (B), BACKER 22841 (L, K).

Corolla white (VAN STEENIS); limb of the corolla milky white, afterwards brownish (ex BACKER l.c.). The flowers open between 11 and 12 a. m. (ex BACKER l.c.).

Vernacular name: *daoen kina* (Java, on account of its bitterness).

Hab.: as a weed in kampongs, in a grassy field; abundant.

Altitude: 25—250 m.

Flowers: June, July, Sept.

Distribution: All trop. Central! and South America!, Africa!. Introduced into S. E. China (Hongkong!), Formosa, Marianne Islands!, Batan Islands, Philippines (Luzon!, Mindoro!, Mindanao!).

7. ROLANDRA.

ROLANDRA ROTTB. Coll. Soc. Med. Havn. II (1775) 256; LESS. in Linnaea IV (1829) 332; LESS. in Linnaea VI (1831) 693; LESS. Syn. (1832) 150; DC. Prod. V (1836) 90; BENTH. et HOOK. Gen. Pl. II (1873—1876) 237; BAILLON Hist. Pl. VIII (1886) 125; HOFFM. in ENGL.-PRANTL IV 5 (1894) 130.

A monotypic genus of South America; introduced into Japan and Java.

(1) **Rolandra fruticosa** (L.) O. K. Rev. Gen. Pl. I (1891) 360; GLEASON in Bull. N. Y. Bot. Gard. IV (1906) 242; *Echinops fruticosus* L. Sp. Pl. ed. I (1753) 815; *Rolandra argentea* ROTTB. Coll. Soc. Med. Havn. II (1775) 256; LESS. in Linnaea IV (1829) 332; DC. Prod. V (1836) 90; BAKER in Fl. Bras. VI 2 (1873—1876) 178; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 131.

Shrub, 40 cm high; *stem* terete, ribbed, sparingly silky tomentose (hairs appressed, long, greyish), nearly glabrous at the lower part, 2½—3½ mm thick; internodes 3—7 cm long. In the axils of the leaves short leafy branches or longer branches like the principal stem, or very short branches (1—2 cm long), bearing 1 or 2 small leaves (1—3 cm long, ½ cm broad) and a head-glomerule. *Leaves* petiolate, (petioles ½—1 cm long, triangularly dilate at the base), elliptic or lanceolate-elliptic, acute at both ends or gradually attenuate into the petiole, subentire or minutely mucronately serrate or slightly repandate, pinni-nerved (lateral nerves 7—14 pairs, prominent, silky greyish tomentose beneath), stout, glabrous, shining, warty above, glandularly spotted, densely silvery felty tomentose beneath, edges recurved; blades 3—9 cm long, ½—3 cm broad. *Heads* in dense glomerules, which are semiglobular, sessile, axillary, 7 mm high, 14 mm wide. Heads sessile, ovate, small, 1-flowered. *Involucre* consisting of 2 scales; scales boat-shaped, compressed from the sides, glabrous, exterior one having a prickle at the top, interior one shorter, 3 mm long. *Flower* exceeding the involucre. *Corolla* subtubular, 5-lobed; lobes lanceo-

late, acute at the top, half as long as the corolla, 3½ mm long. *Anthers* sagittate at the base (tails long), acute at the top. *Style*-branches very short, acute, pubescent, slightly exceeding the corolla. *Achene* turbinate-obovate, triangular, covered with prominent glands at the top and the base, glabrous, 1½ mm long. *Pappus* coroniform, minute, serrate. *Receptacle* hardly perceptible.

Distribution in the Malay Archipelago:

Java: *West Java*: Buitenzorg, BACKER 21374 (B), 22837 (B), LAM 2300 (B) — id. near Tjiliwoeng, HALLIER s.n. (B) — Soekaradja near Buitenzorg, BAKHUIZEN VAN DEN BRINK 3821 (L), 374 (B) — Bodjong Ejot, N.E. of Buitenzorg, BAKHUIZEN VAN DEN BRINK 6344 (L) — Depok, BAKHUIZEN VAN DEN BRINK 1460 (L) — id. near Tjiliwoeng, BAKHUIZEN VAN DEN BRINK 1460 (B) — G. Pantjar, east of Buitenzorg, BAKHUIZEN VAN DEN BRINK 6030 (L).

Flowers white (LAM); erect shrub, up to 1½ m high, stem reddish purple (LAM); woody (HALLIER).

Hab.: in jungles, along waysides, near kampongs, in a Lantana-bush; numerous; common.

Altitude: 90—600 m.

Flowers: May—Sept., Dec.

Distribution: Trop. South America!; introduced into Japan.

EUPATORIEAE DC. Prod. V (1836) 103; HOFFMANN in ENGL.-PRANTL IV 5 (1894) 131; *Eupatoriaceae* BENTH. et HOOK. Gen. Pl. II (1873—1876) 165.

Herbs or shrubs, rarely trees or annuals. *Leaves* opposite, in a few genera alternate, entire or dentate, rarely divided. *Heads* discoid, homogamous. *Involucral scales* imbricate, manyseriate, in some genera reduced to 4, 5 or 6. *Flowers* bisexual, fertile. *Corolla* red, purple, bluish white or pale yellow, tubular, regular, with 5, rarely 4 short teeth. *Anthers* undivided, obtuse, with an apical appendage, as a rule. *Style*-branches terete or semi-cylindric, elongated, obtuse or club-shaped towards the end. *Achene* 4- or 5-angled, rarely flat, terete and 10-ribbed. *Pappus* usually uni- or biseriate; setae stiff, fine. *Receptacle* naked, as a rule, sometimes pubescent.

Key to the subtribes.

Anthers without appendages at tip . . . . . . I. **Piquerinae, p. 468**
Anthers with an apical appendage at tip . . . II **Ageratinae, p. 483**

I. PIQUERINAE HOFFM. l. c. 132; *Piquerieae* BENTH. et HOOK. l. c. 165, 172.

Anthers not appendiculate at the top, nor at the base, rounded at both ends, completely filled with pollen. *Style*-branches clavate at the top.

8. ADENOSTEMMA.

ADENOSTEMMA Forst. Nov. Gen. (1776) t. 45; Less. Syn. Comp. (1832) 156; DC. Prod. V (1836) 110; Miq. Fl. Ind. Bat. II (1856) 23; Benth. Fl. Aust. III (1866) 462; Benth. et Hook. Gen. Pl. II (1873—1876) 239; Clarke Comp. Ind. (1876) iii; Oliver Fl. trop. Afr. III (1877) 299; Hook. Fl. Br. Ind. III (1882) 242; Baillon Hist. Pl. VIII (1886) 131; Hoffm. in Engl.-Prantl Nat. Pfl. IV 5 (1894) 133; Trimen Fl. Ceylon III (1895) 12; Boerl. Fl. Ned. Ind. II (1899) 173; Elmer Leafl. Phil. Bot. I (1906) 98; King et Gamble in Journ. As. Soc. Beng. LXXIV (1905) 28; Koorders. Exc. Fl. Java III (1912) 316; Ridley Fl. Mal. Penins. II (1923) 182; Gagnep. in Lec. Fl. Indo-Chine III (1924) 499; Lemée Dict. I (1929) 82; *Lavenia* Bl. Bijdr. (1825) 904.

Herbs. *Leaves* petiolate, often serrate, pinni-nerved. *Heads* loosely corymbosely paniculate, pedunculate, small, many-flowered; *involucre* campanulate or basin-shaped, biseriate; scales subequal, herbaceous, more or less connate at the base, often glandular. *Corolla* tubular, small, 3—5-fid. *Anthers* without apex or shortly obtusely appendiculate. *Style*-branches slender, long thickened at the top. *Achene* obovate-oblong, subangular, 3—5-ribbed, glandular when young, afterwards glabrous or warty. *Pappus* consisting of few clavate setae, usually thickened at the top. *Receptacle* naked, nearly flat.

About 14 species: 6 species in trop. America (Mexico, Ecuador, Brazil!, West Indies!, Peruvia, Bolivia!); 4 species in Africa (South Africa, Abyssinia); 4 species in trop. Asia, of which one also in Australia! and New Guinea!

Most probably more species will be distinguished in British India.

Key to the species.

1. a. Achenes afterwards warty 2
   b. Achenes afterwards glabrous 3
   c. Achenes afterwards scabrid . . . . (3) **A. hirsutum.**

2. a. Corolla infundibuliform (limb not to be separated from the tube), glandular especially at the lower, more or less hirsute at the upper part (hairs white), $1\frac{1}{2}$—2 mm long. Style-branches long exserting the corolla . . . . (1) **A. Lavenia.**
   b. Corolla very small, 1 mm long; limb campanulate, $\frac{1}{2}$ mm long, glandular, densely tomentose, tube covered with stalked glands. Style-branches hardly exserting the corolla . . . . (2) **A. parviflorum.**

3\. a. Achene afterwards quite glabrous; corolla 3 mm long, limb tomentose, tube glandular. Leaves glabrous (very rarely scarcely pilose) at both sides, more or less shining above, when dry. (4) **A. macrophyllum.**

b\. Achene always covered with glands; corolla 1½ mm long, covered with prominent glands. Leaves densely, sl[illegible]y and scabridly hirsute . . (5) **R. Renschii.**

(1) **Adenostemma Lavenia** (L.) O. K. Rev. Gen. Pl. I (1891) 304 — Pl. III, 43—44.

Herb, perennial (?), 25—75 cm high; lower part of the stem rooting, more or less creeping; *stem* subterete, ribbed, glandularly pubescent or subglabrous, 1—6 mm thick, sometimes reddish; internodes 1½—8 cm long. *Leaves* petiolate (petioles ½—3½ cm long) or sessile, superior ones ovate, oblong-ovate, elliptic-ovate, lanceolate or lanceolate-elliptic, acuminate at the top (top subobtuse or acute), suddenly narrowed, afterwards gradually attenuate into the petiole (superior ones nearly rounded at the base), angularly dentate, or coarsely serrate, sometimes double-serrate(teeth ending into a minute projection, subacute or obtuse, to 6 mm long), lower part entire, pinni-nerved (lateral nerves 5 on each side, candalabrum-like bent), lowest ones very long, reticulations obscure or subtrinervate, glabrous or subglabrous on each side (except the slightly rusty pubescent nerves), warty on each side, (especially beneath), membranous, with petiole 2—25 cm long, 6—90 mm broad; higher ones smaller. *Heads* pedunculate (peduncles rusty glandularly pubescent, hairs articulate) slender, with a small linear bract at the base or halfway, 1—3 cm long), campanulate or subglobose, about 30-flowered, 5½—7 mm long and about as wide, in terminal thin dichotomous paniculate corymbs. *Involucre* campanulate, biseriate; scales connected at the base, subequal in length, glabrous or slightly pubescent at the lower part, with scattered glands, oblong-lanceolate or oblong-ovate, obtuse at the top, 3-nerved, foliaceous, 3—4 mm long, ½—1 mm broad; of the inner row slightly broader; of the outer row sometimes ciliate at the edges. *Corolla* infundibuliform (limb not to be separated from the tube), glandular (especially on the lower part), more or less hirsute on the upper part (hairs white), 1½—2 mm long, 4-lobed; lobes deltoid, acute at the top. *Anthers* obtuse at both ends, short, ovate. *Style*-branches dilate at the upper part, glabrous, much exceeding the corolla, about 2½ mm long. *Achene* obovate-oblong, irregularly subtriangular, densely glandularly warty (glands stalked, small, prominent), afterwards yellowish or brownish densely warty (warts small, cylindric, not broadened beneath, numerous), nearly 1 mm wide, 3—4 mm long, on a minute thickened callose stalk). *Pappus* consisting of 3 or 4 clavate setae, 1½ mm long, glandular on the upper thickened part,

connected by a ring at the base. *Receptacle* basin-shaped, deeply alveolate, glabrous, nearly flat, afterwards conical (cf. notes on p. 475—476).

Distribution: Br. India, Mal. Penins., Indo-China, S. China, Japan, Formosa, Philippines, Mal. Arch., New Guinea, Australia, Pacific Islands.

1. var. **typicum**; *Verbesina Lavenia* L. Sp. Pl. ed. I (1753) 902, ed. II (1763) 1271; BURM. Fl. Ind. (1768) 183; ROXB. Fl. Ind. III (1832) 442; *Adenostemma Lavenia* O. K. Rev. Gen. Pl. I (1891) 304; MERRILL Interpret. Herb. Amb. (1917) 497; MERRILL in Journ. R. As. Soc. (1921) 587; MERRILL Enum. III (1923) 596; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1431 (syn. excl.); MERRILL Pl. Elm. Born. (1929) 300; MATTF. in Engl. Bot. Jahrb. LXII (1929) 403; ALSTON Suppl. Fl. Ceylon VI (1931) 160; BACKER Handb. Suikerr. Java VII (1932) 755 (excl. syn.) — *Olus scrofinum album* RUMPH. Herb. Amb. VI (1750) 34 t. 14 fig. 1; *Adenostemma viscosum* FORST.! Char. Gen. (1776) 90; DECAISNE Herb. Timor (1835) 85; DC. Prod. V (1836) 111; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 225; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. 1854) 120; MIQ. Fl. Ind. Bat. II (1856) 23; BENTH. Fl Hongkong. (1861) 171; BENTH.! Fl. Austr. III (1866) 462; (non CLARKE! Comp. Ind., 1876, 28); KURZ in Journ. As. Soc. Beng. XLVI 2 (1877) 197; HOOK. Fl. Br. Ind. III (1882) 242; FORBES et HEMSLEY in Journ. Linn. Soc. XXIII (1886—1888) 403; TRIMEN Fl. Ceylon III (1895) 13; KOORDERS in Meded. L. Pl. XIX (1898) 505; BOERL. Fl. Ned. Ind. II (1899) 235; KOORDERS in Nat. Tijdschr. Ned. Ind. LX (1901) 254; CLARKE in Bot. Tidskr. XXIV (1902) 243; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV 2 (1905) 28; ELMER Leafl. Phil. Bot. I (1906) 99; HAYATA in Journ. Sci. Tokyo XXV (1908) 124; KOORDERS Exc. Fl. Java III (1912) 316; GAMBLE Fl. Madras IV (1921) 677; RIDLEY Fl. Mal. Penins. II (1923) 182; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 499; RENDLE in Journ. Bot. LXIII suppl. (1925) 54; *Lavenia fastigiata* BL.! Bijdr. (1825) 906; *Adenostemma fastigiatum* DC. Prod. V (1836) 111; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 227; MIQ. Pl. Jungh. (1854) 497; MIQ. Fl. Ind. Bat. II (1856) 25; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 120; BOERL. Fl. Ned. Ind. II (1899) 236; *Adenostemma viscosum* FORST. var. *Fastigiatum* CLARKE Comp. Ind. (1876) 29; HOOK. Fl. Br. Ind. III (1882) 243.

Leaves petiolate, oblong-obovate or elliptic-ovate, acuminate at the top (top subobtuse or acute); with petiole 7—25 cm long, 2½—8 cm broad.

Distribution in the Malay Archipelago:

S u m a t r a: *East Coast*: Bandarbaroe, near Medan, LÖRZING 5833

(B); *Tapanoeli*: between Habinsaran-plateau and Toba-lake, LÖRZING 1631 (B) — Toba near Tarrambilan, OUWEHAND 316 (B) — Upper Bila, plain, LÖRZING 9721 (B) — Oeloe Bila, CRAMER 112 (B); *West Coast*: Ophir district, BÜNNEMEYER 270 (B); *Lampongs*: Telokbetong, BACKER s.n. (B) — P. Sebesie, DOCTERS VAN LEEUWEN 5124 (B); Sumatra, KORTHALS s.n. (L).

Simaloer: near Sumatra: ACHMAD 44 (L).

Batoe Islands: *P. Pini*, RAAP 455 (B) — *P. Tello*, RAAP 401 (B), 440 (B), 49 (B), leaves hardly serrate, but mucronate.

Lingga Arch.: *P. Lingga*, kampong Daik, BÜNNEMEYER 6641 (L) — *P. Singkep*, BÜNNEMEYER 7101 (B).

Riouw Arch.: *P. Bintan*, G. Bintan, BÜNNEMEYER 6105 (L) — *P. Papan*, BÜNNEMEYER 7783 (B) - *P. Toedjoeh*, BÜNNEMEYER 5987 (B).

Java. *West Java*: Buitenzorg, BACKER s.n. (L), BOERLAGE s.n. (L), HALLIER 158 (B), BAKHUIZEN VAN DEN BRINK 433 (B), SOEGANDIREDJA 28 (B), BACKER 4088 (B), 5872 (B), 6190 (B), VAN STEENIS 420 (B) — Batavia, BACKER s.n. (L, B, U), VORDERMAN s.n. (B) — Meester Cornelis, BACKER s.n. (L, B) — Depok, KOORDERS 31290 (L), 44004 (B), BURCK and DE MONCHY s.n. (B), BACKER 31547 (B) -- G. Salak, DE MONCHY s.n. (B), LAM 220 (B) — G. Gede near Tjibeureum, PULLE 4056 (U) — Kandangsapi, Batavia, KORTHALS s.n. (L) -- Tjibodas, LÖRZING 1482 (U), HALLIER 382 (B), RAAP 294 (L) — Poerwakarta, BACKER 13848 (L) — near Bandjar, BACKER s.n. (L, U), 33020 (B) — Priangan, KOORDERS 34640 (L) — Tjibogo near Tjiledoeg, JUNGHUHN 388 (L) — Goenoengkantjana, KOORDERS 41149 (B) — Pandaglang, BEUMÉE A 615 (B), BACKER 7505 (B) — line from Batavia to Bantam, Tendjo, BACKER 24028 (B) — near Tjiandjoer, BACKER 23637 (B) — near Moentjang, Bantam, BACKER 1855 (B) — near Zandbaai, Djampangkoelon, BACKER 886 (B), 17528 (B) — Rankasbitoeng, BACKER 1011 (B) — near Buitenzorg, Tjiloear, BERCK s.n. (B) — Kalipoetjang, Priangan, BACKER 4395 (B) — Menes, BACKER 7141 (B) — G. Tjikorai, BURCK s.n. (B) — Tjibadak, Priangan, BAKHUIZEN VAN DEN BRINK 3181 (B) -- Leuwiliang, Buitenzorg, BACKER 26401 (B) — Batoetoelis near Buitenzorg, BAKHUIZEN VAN DEN BRINK 1121 (B), with very small leaves, 1—2 cm broad, 2½—3 cm long; petioles 1 cm long; plant 23 cm high — Radjamandjala, Priangan, BACKER 13481 (B); *Middle Java*: G. Prahoe, JUNGHUHN s.n. (U) — Salatiga, DOCTERS VAN LEEUWEN—REYNVAAN 71243 (B) — Djapara, KOORDERS 33490 (B) — Ngarengan, Djoewana, KOORDERS 33500 (B) — Noesa Kambangan, KOORDERS 30854 (B), VAN STRAELEN 37 (B) — Banteran, Banjoemas, BEUMÉE 1197 (B), 4854 (B) — Poerwakarta, BACKER

82 (B) — Madjenang, Backer 18550 (B), 18721 (B) — Tegal, Beumée 1905 (B) — Margasari, Pekalongan, Beumée 5350 (B) — Soebah, Pekalongan, Kooper 506b (B) — Bandjaran, Koedoes, Beumée 4102 (B) — Kendal, Cordes s.n. (B) — Oengaran, de Visser Smits s.n. (B); *East Java*: G. Hijang, Backer 9743 (L) — near Rogodjampi, Zollinger 3220 (L) — G. Wilis, coll. unkn. (B) — Gadoengan, Pare, Kediri, Koorders 40814 (B) — Dawoeng, Kediri, Grutterink 3047 (B) — South-Kediri, Beumée 2346 (B) — Kediri, Koorders 28228 (L) — Malang, Backer 3504 (B) — Gondang near Malang, Koens s.n. (B), Zollinger 222 (B, K) — Prigi, Blitar, Backer 11868 (B) — Soekaredjo, Blitar, Koorders 22823 (B) — Sitoebondo, Backer 24437 (B) — Djember, Ultée s.n. (B); Java, Zollinger 792 (K, L), s.n. (U), Blume 1838 (L), Horsfield 70 (K), sub nomine *Adenostemma fastigiatum*, Junghuhn s.n. (U).

Madoera: Bilapoera, Bremekamp s.n. (B) — G. Geger, Zollinger 1783 (L).

Flores: Endeh, Rensch 1032 (B).

Timor: Koepang, Brown s.n. (Br. M.); Timor, Spanoghe s.n. (L).

Borneo: *Br. N. Borneo*: Tawao, Elmer 21252 (K, U, B); N. Borneo, Pladjoe, Amdjah 20 (B); Br. N. Borneo, Castro and Melegrito 1699 (B), *S.E. Borneo*: Banjermasin, Korthals s.n. (L), Motley 364 (K) — Tanahboemboe, Batoelitjin, van Slooten 2138 (B); *West Borneo*: P. Madjang, Teysmann 8304 (B), 8307 (B).

Celebes: *Manado*. near Manado, Koorders 245 (B), 16415 (B) — Tondano, Kruyff 52 (B) — Minahassa, near Belang, Lam 2461 (B).

Saleier: *P. Kalao*, Docters van Leeuwen 1491 (U).

Talaud Islands: P. Salibaboe, G. Ajambanan, Lam 3088 (B).

Moluccas: *Ternate*: Beguin 966 (B); *Amboina*: Hitoe mesing, Rant 851 (B) — Amboina, Robinson 427 (L, B, K), Webb s.n. (K), Teysmann s.n. (B); *Banda Islands*: Moseley s.n. (Br. M.); Banda, Blume s.n. (L), Blume identified this non-flowering specimen as *Pilea Kathurang* Bl., but Hallier, in Rec. Trav. Bot. Néerl. XV, 1918, 32, brought it to the right species.

Kai Islands: Riedel s.n. (K).

Aroe Islands: (ex Mattfeld l.c.).

In the specimens from Borneo, Lingga Arch. and Riouw Arch. the warts of the achenes are small and crowded; in those of Java and Sumatra they are mostly bigger.

Flowers white (Backer a.o.); style white (ex Backer l.c.); plant sticky (van Slooten).

Vernacular names: *kedjo béjar, taspong, bandotan, trasèn, gletang warak, domdoman, seprah, daoen roempoet babie, orang aring, djoekoet mandel* (all Java),

saimembah (Sumatra), *sadaria* (Lingga Arch.), *tempoeloet babie* (Borneo), *salawei, rockoet riritjet* (both Celebes), *tjofo roki* (Ternate), *ali oto.*

Hab.: in teak and other forests, in jungles, along edges of ditches and waysides, along the edge of a rice field, in fields, in kampongs, on a beach; in moist, more or less shady places; on sandy, volcanic and rocky soils; solitary or many together; scattered, locally common.

Altitude: 0—2100 m.

Flowers during the whole year.

Use: Food for pigs (ex HEYNE). Leaves together with salt against a sore throat (ex HEYNE). In case of head-ache the natives put the leaves on their foreheads (Riouw Arch., BÜNNEMEYER). Against sprue (ex HEYNE).

Distribution: South Asia: Punjab!, Himalaya!, Ceylon!, Madras!, Kanura!, Nepal!, Assam!, (Khasia!), Mal. Penins.!, Burma!, Cambodge!, Tonking!, Cochinchina!, Siam!, Annam!, Laos; China (Yun-nan-sen!, Canton!, Ichang!, Fokien, Hupeh, Kwantung, Hongkong, Luchu Arch.); Japan (Nagasaki!), Formosa, Philippines (Luzon!, Mindanao, Culion, Catanduanes, Leyte!, Babuyan Islands); New Guinea!, Marianne Islands, Bismarck Arch., Salomons Islands!, Samoa Islands!, Sandwich Islands!, Fiji Islands!, Marquesas Islands!, Rawak; Australia! (N. S. Wales, Queensland, S. Australia).

2. var. **lanceolatum** (MIQ.) nov. comb.; *Adenostemma lanceolatum* MIQ.! Fl. Ind. Bat. II (1856) 24; BOERL. Fl. Ned. Ind. II (1899) 236.

Leaves lanceolate-elliptic, gradually attenuate into the petiole; blades 6—20 cm long, 2—5 cm broad. Warts of the *achene* thin.

Distribution in the Malay Archipelago:

Sumatra: Palembang, Moeara doea, DE VOOGD 29 (B).

Java: HORSFIELD s.n., sub *Adenostemma lanceolatum* det. MIQUEL (U, K).

Celebes: *S.E. Celebes*, Kendari, KJELLBERG 466 (B).

Saleier: *P. Kalao*, DOCTERS VAN LEEUWEN 1491 (B).

Borneo: *N. Borneo*, Pladjoe, AMDJAH 106 (L); *S.E. Borneo*, Banjermassin, KORTHALS s.n. (L) — Doesson, KORTHALS s.n. (L).

Ceram: N. Central Ceram, KORNASSI 1365 (L); E. Ceram, Kraai, exp. RUTTEN 970 (L).

Flowers white (KJELLBERG a.o.).

Vernacular names: *watiloa* (Ceram), *tjampa poeloet* (Sumatra).

Hab.: in primeval and teak forests, on banks of brooks; frequent, except in Celebes; in very wet places.

Altitude: 0—300 m.

Flowers: Febr., May, June, Dec.

Distribution: New Guinea!

3. var. **microcephalum** (CLARKE) nov. comb.; *Adenostemma microcephalum* DC. Prod. V (1836) 111; *Lavenia viscida* WALL. Cat. (1828) 3222!; *Adenostemma viscosum* FORST. var. *microcephalum* CLARKE Comp. Ind. (1876) 29; KURZ in Journ. As. Soc. Beng. XLVI 2 (1877) 197.

Small herbs, 13—35 cm high. *Leaves* petiolate, ovate or elliptic-ovate, glabrous, obtuse at the top; blades 3—9½ cm long, 1½—3 cm broad. *Heads* few, small, 3—4 mm long, 4—5 mm wide, on long filiform peduncles. *Corolla* very small, 1 mm long; *style*-branches hardly exserting the corolla.

Distribution in the Malay Archipelago:

Ceram: Moatipa, Central Ceram, RUTTEN 1998 (L, B).

Flowers white (RUTTEN).

Altitude: 1000—1300 m.

Flowers: Jan.

Distribution: Bengal, Assam (Khasia!), Burma; New Guinea!

4. var. **subsessilifolium** nov. var.

Folia parva, subsessilia, lanceolata, basi longe, apice breviter attenuata, apice subobtusa, 6—10 mm lata, 2—4 cm longa.

Distribution in the Malay Archipelago:

Sumatra: Atjeh, Kebajahan, near the river Laoet Tawar, FREY WYSSLING 55 (B), type specimen.

Hab.: in a former rice field.

Flowers: June.

This variety is to be distinguished from *Adenostemma Lavenia* (L) O. K. var. *angustifolium* EDGEW. in CLARKE! Comp. Ind. (1876) 29, occurring in Ceylon!, Sikkim! and Siam!, by the achenes, which are in *Ad. Lavenia* (L.) O. K. var. *angustifolium* glabrous and glandular, afterwards quite glabrous, not warty. Most probably this plant belongs to a different species, on account of its glabrous achenes.

This species is usually considered to be pantropical (MERRILL, MATTFELD a.o.). Most probably it does not occur in Africa, nor in America. The American forms indentified as *Adenostemma Lavenia*, have a quite glabrous, infundibuliform corolla, of which the long tube is glandular, and achenes, of which the glands are crowded and much prominent.

HUMBERT (Comp. Madagascar, 1923, 33) mentions *Adenostemma viscosum* from Madagascar; he describes the achenes as glabrous but he does not record anything about warts. Thus his determination is not quite certain.

Adenostemma Perrottetii DC. from Africa is much related to *Adenostemma Lavenia*; however, the warts of the achene are long and prominent, like those of the American forms, described above.

The species of *Adenostemma* are extremely difficult to separate. A specimen of FORSTER in the Kew Herbarium, to which is added a label, on which is written „Adenostemma viscosa (Forster); habitat in Jaheitu" is certainly a specimen of *Adenostemma parviflorum* (BL.) DC. Though it is a bad specimen (as to the shape of the leaves and the corolla), the size of the corolla, the pubescence of the leaves and the warts of the achenes can be stated to agree with those of *Adenostemma parviflorum*. The type specimen of *Adenostemma viscosa* FORSTER in the herbarium of the British Museum quite agrees with the specimens of *Adenostemma Lavenia* (L.) O. K. examined. The specimen to which CLARKE has added „Adenostemma viscosum Forst. mihi typicum C. B. Clarke" (WALLICH $\frac{3220}{330}$, Silhet, to which is added „Lavenia alba

Wall.") belongs to a different species, on account of its achenes, afterwards quite glabrous, whereas the type specimen of FORSTER has achenes with small warts.

BENTH. and HOOK. l.c. 240 and CLARKE l.c. 30 suppose, that in the tropics of the Old World only one species of *Adenostemma* with many varieties is to be found; this was also accepted by HOOKER l.c. 242. In the Mal. Arch., however, there are 5 distinct species. *Adenostemma Lavenia* is very variable indeed.

(2) **Adenostemma parviflorum** (BL.) DC. Prod. V (1836) 111 (cum var. *divaricatum*); ZOLL. in Nat. Gen Arch. Neêrl. Ind. II (1845) 227; MIQ. Fl. Ind. Bat. II (1856) 24; BOERL. Fl. Ned. Ind. II (1899) 236; *Lavenia parviflora* BL. Bijdr. (1825) 906; *Lavenia erecta* BL.! Bijdr. (1825) 906 (non alior.); *Adenostemma ovatum* MIQ.! Fl. Ind. Bat. II (1856) 25; *Adenostemma viscosum* FORST. var. *parviflora* HOOK. Fl. Br. Ind. III (1882) 242 (p.p.); *Adenostemma Lavenia* O. K. var. *parviflorum* HOCHREUTINER in Candollea V (1931—1934) 298 — Pl. III, 48—49.

Herb. 35—70 cm high, erect. *Stem* subterete of subangular, ribbed, glandularly pubescent, 2 mm thick, rooting at the lower part; internodes 3½—8 cm long. *Leaves* petiolate (petioles 1—3½ cm long), ovate or broadly ovate, obtuse at the top, suddenly attenuate at the base, afterwards shortly gradually attenuate into the petiole, serrate (teeth obtuse, subacute or acute), sparingly shortly strigose at both sides, submembranous or chartaceous, pinni-nerved (3-nerved from the base, inconspicuously reticulated) blades 4—16 cm long, 2—7 cm broad; of the higher leaves smaller. *Heads* thinly paniculate, panicles terminal. Heads pedunculate (peduncles hirsute, glandular, 7—25 mm long), subglobuse, 25—40-flowered, 5 mm high, 5—6 mm wide. *Involucre* 1—2 seriate; scales 12—15, elliptic-oblong, subacute or obtuse at the top, hirsute all over, slightly glandular. *Corolla* very small, 1 mm long, 3- or 4-lobed; limb broadly campanulate, densely tomentose (hairs crispy, white, existing of more cells); tube much more narrow, glandular (glands stalked), dilate at the base; lobes broad, triangular, acute at the top. *Anthers* 3 or 4, broad, oblong, obtuse at both ends. *Style*-branches dilate at the top, shortly exserting the corolla. *Achene* obovate-oblong, subtriangular, slightly curved, densely glandularly tuberculate (tubercles afterwards conical, obtuse, thick), 2½ mm long, nearly 1 mm thick. *Pappus* consisting of 3 or 4 clavate projections, glandular at the superior, thickened part, connected by a thickened ring at the base, ½ mm long. *Receptacle* nearly flat, afterwards conical, alveolate.

Distribution in the Malay Archipelago:

S u m a t r a: *East Coast*: Asahan, Karo district, BARTLETT and LA RUE 146 (L) — to the west of G. Sinaboeng, LÖRZING 9041 (B) — Karo-

plateau near Brastagi, LÖRZING 6735 (B) — id. near Siosar, LÖRZING 8540 (B), 6173 (B) — Sibolangit near Medan, LÖRZING 3903 (B) — N.W. of the lake of Toba, foot of G. Piso-Piso, LÖRZING 9382 (B); *Tapanoeli*: Toba, Locgoe Roti, OUWEHAND 104 (B); *West Coast*: G. Koerintji, BÜNNEMEYER 9438 (L), 8760 (U), 8188 (B) — near Mangani, LKoto, BÜNNEMEYER 3024 (L) — G. Koeriman, LKoto, LÖRZING 3311 (B) — Fort de Kock, BÜNNEMEYER 1299 (B) — Brani, Agam, BÜNNEMEYER 3216 (B); *Palembang*: Ranau, DE VOOGD 533 (B) — near Ranau-lake, VAN STEENIS 3279 (B).

Java: *West Java*: Buitenzorg, BLUME s.n. (L), HALLIER 158 (L), 158c, g, (L), NATIVE COLL. s.n. (L), SOEGANDIREDJO 191 (L), BURCK and DE MONCHY s.n. (B), BACKER s.n. (B) — G. Panemdjoan, West of Buitenzorg, BACKER 10588 (B) — Nirmala near Buitenzorg, BACKER 11169 (L) — Tjibeber, Priangan, BAKHUIZEN VAN DEN BRINK 1934 (L, B), SIHAJA s.n. (B), BACKER 22855 (B), 22378 (B), WINCKEL 1437 (L) — Tjiandjoer, Priangan, BACKER 3004 (B) — id. Takoka, KOORDERS 14962 (B) — Tasikmalaja, KOORDERS 47985 (L), 47986 (B) — Goenoengkantjana, KOORDERS 41045 (B) — Bandoeng, BACKER s.n. (L, U, B), 12219 (B), DOCTERS VAN LEEUWEN 2540 (B) — Sindanglaja, BACKER 21521 (L), VALETON 8 (B) — Tjibodas, KOORDERS 31928 (L), HALLIER 382 (L) — Soekaboemi, DE VISSER SMITS s.n. (B) — G. Pamindjoan near Soekaboemi, BACKER 14779 (B) — Djampangkoelon between Lenkong and Tjitoeroeg, BACKER 17151 (L) — G. Gede, KRAMER 106 (B) — G. Boerangrang, BACKER 14073 (B) — to the south of Nanggerang, Priangan, BACKER 33023 (B) — Dago, Priangan, KOORDERS 253 (B) — between Djasinga and Pasir Madang, Batavia BACKER 10353 (B) — river Tjiserai, BLUME s.n., sub nomine *Lavenia erecta* Sw. (L); *Middle Java*: Soerdjo, Batang, KOORDERS 23901 (L) — G. Slamat, BACKER 273 (B) — Doro, Pekalongan, BACKER 15731 (B) — G. Sendoro, LÖRZING 356 (B) — Pelemojo, Semarang, KOORDERS 27677 (B); *East Java*: Ngebel, Madioen, RANT s.n. (L), KOORDERS 29897 (L) — near Soekaredjo, Blitar, KOORDERS 22938 (L, B) — Tangkil, Southern hills, KOORDERS 23075 (B); Java, BLUME s.n. (L), det. SCH.-BIP. s.n. (L), det. MIQ. s.n. (U).

Lombok: Swela, RENSCH 86 (B).

Flores: Rana Mese, RENSCH 1298 (B).

Borneo, KORTHALS s.n. (L).

Celebes: *Manado*, near Tondano, FORBES? 133 (L) — Goeroepahi, KAUDERN 81 (L); *S.W. Celebes*: Malino, LÖRZING 10771 (B) — G. Bonthain, BÜNNEMEYER 12622 (B).

Flowers white (BÜNNEMEYER, a.o.); plant reddish (VAN STEENIS).

Vernacular names: *taspong, djotang badah, kédjo béjar, djotang nabandoengan, domdoman, trasèn* (all Java), *pessel* (Sumatra), *djoekoet moeriah.*

Hab.: in bamboo and other forests, in jungles and grassy fields, in (dry) rice fields, along waysides, in a ditch; in moist, shady places; locally common, numerous.

Altitude: 300—1500 m.

Flowers during the whole year.

Distribution: Mal. Penins.! (leaves extremely large), China (Yunnan!, leaves glabrous), Philippines (Panay!), New Guinea!, New Caledonia! (leaves very large), Hawaian Islands!, Samoa Islands!, Society Islands!.

(3) **Adenostemma hirsutum** (BL.) DC. Prod. V (1836) 113 — Pl. III, 45.

Herbaceous, not much branched, 30—100 cm high. *Stem* (especially superior parts) glandularly pubescent (gland-hairs crispy, purplish striate), slightly grooved, 3—4 mm thick; lower part of the stem creeping and rooting; internodes 2—7 cm long. *Leaves* petiolate (petioles 1—3 cm long), ovate, acute or subobtuse at the top, edges recurved, (gradually or suddenly at first, gradually afterwards) attenuate into the petiole, sharply, more or less coarsely serrate or repand-dentate, sparsely, shortly hirsute at both sides, paler beneath, pinni-nerved (3 or 4 pairs of lateral nerves; nerves scabridly pubescent beneath, extreme ones reticulate, more or less prominent beneath); blades 2½—13½ cm long, 2—8½ cm broad; superior ones smaller, to 2½ cm long, to 1½ cm broad; petioles ½ cm long. *Panicles* consisting of few heads (5—25), narrow, terminal; branches dichotomous, diffuse. *Heads* pedunculate (peduncles long, slender, pubescent, hairs purplish striate), 2½—3 cm long, having a small, linear bract at the base or, half-way), subglobose or semi-globose, 20—30-flowered, 6—9 mm high, 7—10 mm wide. *Involucre* basin-shaped, subcampanulate, 1—2 seriate; scales about 12, oblong, acute or subobtuse at the top, hirsute, ciliate at the edges (hairs purplish striate), connected at the base, 4—5 mm long, 1 mm broad. *Corolla* slightly curved, 2½—3 mm long; limb narrowly campanulate, 5—4-lobed, tomentose at the top (hairs long, white); lobes short, triangular, acute at the top; tube as long as limb, glandularly hirsute (gland-hairs short, purplish). *Anthers* broad, truncate at both ends. *Style*-branches fairly long exserting the corolla, thickened, obtuse, obovate at the top, 3—5 mm long. *Achene* subtriangularly obovate, slightly bent, glandularly scabrid, never warty, 1 mm broad, 3½ mm long. *Pappus* consisting of 3 or 4 cartilagineous projections, thickened and glandular at the top, connected by a ring at the base. *Receptacle* nearly flat, afterwards subconical, alveolate.

Distribution: Java and Bali.

1. var. **typicum**; *Lavenia hirsuta* BLUME! Bijdr. (1825) 905; *Adenostemma hirsutum* DC. Prod. V (1836) 113; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 227; SCH.-BIP. in ZOLL. Verz. Ind. Arch. (1854) 120; MIQ. Pl. Jungh. (1854) 497; MIQ. Fl. Ind. Bat. II (1856) 26, incl. var. β; BOERL. Fl. Ned. Ind. II (1899) 236; *Adenostemma Lavenia* O. K. var. *elatum* HOCHREUTINER in Candollea V (1931—1934) 298.

Leaves flat, ovate-oblong or broadly ovate, submembranous; blades 5--12 cm long, 2—7 cm broad.

Distribution in the Malay Archipelago:

Java: *West Java*: Garoet, BURCK 216 (L) — G. Kendang near Garoet, KOENS 220 (B) — G. Masigit, Rongga, LÖRZING 1243 (B) — Patoeha near Bandoeng, LÖRZING 1300 (B), 1285 (B) — G. Mandalagiri, LAM 339 (B), 272 (B) — G. Gede, BACKER 3192 (B) — id., Talaga Warna, HOCHREUTINER 1199 p.p. (G) — G. Pangerango, Tjibodas, VAN SLOOTEN 9 (B), VAN STEENIS 1869 (B) — G. Tjeremai, BACKER 5132 (B); *Middle Java*: G. Oengarang, JUNGHUHN 322, sub var. β MIQ. det. MIQ. (L); *Djocjakarta*: G. Gamping, JUNGHUHN s.n. (L); *East Java*: G. Hiang, ZOLLINGER 792 (B); South East Java, FORBES 1132c (Br. M.); Java, BLUME s.n. (L), JUNGHUHN 391 (L).

Flowers white (LAM, a.o.); whitish or partly purplish, when dry. Style white (LÖRZING).

Vernacular names: *leketang wara, tomboeron* (both Java).

Hab.: in primeval and other forests, along waysides, on limestone rocks; numerous, scattered.

Altitude: 1200—2000 m.

Flowers: March—Oct.

2. var. **bullatum** nov. var.

Folia bullata, deltoideo-ovata, subcoriacea, sparse scabride hirsuta; laminae 2½—13½ cm latae, supra nitidae, nervis subtus prominentibus.

Distribution in the Malay Archipelago:

Java: *West Java*: G. Papandajan, VAN STEENIS 4334 (B) — Tjibodas, KOORDERS 31887 (B) — Patoeha near Bandoeng, LÖRZING 1285 (B) — G. Malabar, Priangan, ANDERSON 335 (K); *Soerakarta*: G. Merbaboe, DEN BERGER 95 (B), type specimen, BACKER 30277 (B); *Middle Java*: G. Prahoe, LÖRZING 320 (B); *East Java*: G. Widodaren, summit, Malang, BACKER 3701 (L) — near Nonkodjadjar near Lawang, WISSE 543 (B) — G. Tengger, KOORDERS 37967 (L), 3777 (B) — near Ngadisari, Probolinggo, KOORDERS 37770 (K) — G. Raoeng, CLASON-LAARMAN 123 (B) — Idjen-plateau, KOORDERS 19878 (B).

Flowers white (KOORDERS), violet (LÖRZING, VAN STEENIS), reddish (LÖRZING); style whitish (LÖRZING). Taste bitter (LÖRZING).

Vernacular name: *trasèn*.

Hab.: in forests, in a former coffee plantation, in grassy fields and jungles, in a ravine; in shady places; few to many; not common.

Altitude: 1400—2400 m.

Flowers: March—June, Oct., Nov.

Of this variety a very small specimen, 15—25 cm high, branched at the base, has been collected in Bali. Leaves small; blades 1½—2 cm long, 1—1½ cm broad, upper ones smaller; petioles ½—1 cm long; few (1—5) heads in the inflorescence; corolla 2 mm long. This specimen has been collected on the G. Batoekoea, 1655 m, SARIP 42 (vernacular name: *teledted*).

(4) **Adenostemma macrophyllum** (BL.) DC. Prod. V (1836) 113; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 227; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 120; *Lavenia macrophylla* (incl. var. *repens*) BL.! Bijdr. (1825) 905; *Adenostemma Madurense* DC. in WIGHT Contr. Bot. Ind. (1834) 9; DC. Prod. V (1836) 113; *Adenostemma fastigiatum* DC. var. *macrophyllum* MIQ. Fl. Ind. Bat. II (1856) 25; BOERL. Fl. Ned. Ind. II (1899) 236. — Pl. III, 46—47.

Large herb, 30—100 cm high, branched; creeping and rooting at the lower part of the stem. *Stem* glabrous or pubescent at the upper part (hairs dark brownish-reddish striate), grooved, 2—7 mm thick; internodes 6—8 cm long. *Leaves* large, petiolate (petioles 2—9 cm long), broadly ovate, acuminate and acute at the top, suddenly, afterwards gradually attenuate into the petiole, often rugose, membranous or chartaceous, finely or more or less coarsely distantly serrate (teeth acute or obtuse, ending into a small projection) or mucronulate, entire at the lower part, or subentire, glabrous at both sides (rarely shortly pubescent on the nerves beneath), more or less shining above, paler green beneath, pinninerved (nerves more or less prominent beneath; lateral ones 4 pairs, candalabrum-shaped, lowest pair almost reaching the top; extreme nerves reticulate); blades 10—24 cm long, 5—14 cm broad, higher ones smaller. *Inflorescence* large, corymbose, terminal; branches dichotomous, slightly pubescent, having small linear bracts at the base. *Heads* pedunculate (peduncles long, pubescent, 1½—3 cm long), campanulate, 25—30-flowered, 7—8 mm high, 5—7 mm wide. *Involucre* basin-shaped, 2-seriate; scales obovate-oblong, rounded at the top, subglabrous or puberulous at the basal part, glandular at the upper part, ciliate at the edges, 4—5 mm long, 1—1½ mm broad. *Corolla* narrowly campanulate, 4—5-lobed, 3 mm long; lobes short, deltoid, broad, acute at the top; limb tomentose, tube glandular, nearly as long as the limb. *Anthers* short, obtuse at both ends; filamentum dilate at the base. *Style*-branches elongated, clavate, thickened and obtuse at the top, glabrous, extremely long exserting the corolla, 4—5 mm long. *Achene* oblong, irregularly triangular, slightly

curved, glandular, smooth, afterwards blackish, quite glabrous, without glands, 3—3½ mm long. *Pappus* consisting of 3 or 4 clavate setae, 1½ mm long, glandular at the upper, thickened part, connected by a ring at the base. *Receptacle* alveolate, slightly basin-shaped, nearly flat, afterwards subconical.

Distribution in the Malay Archipelago:

Sumatra: *Atjeh*: Takengon, VAN STEENIS 5951 (B); *East Coast*: G. Sinaboeng, LÖRZING 8225 (B) — Brastagi near Medan, RIDLEY s.n. (K) — Bandarbaroe near Medan, LÖRZING 4691 (L, B); *West Coast*: G. Singgalang, BECCARI s.n. (L, K), BÜNNEMEYER 2580 (L), 2648 (B), 2625 (B), 2843 (B), LEEFMANS 19 (B), MATTHEW s.n. (K) — G. Talamau, BÜNNEMEYER 699 (B), 592 (B), 791 (B), 944 (B) — G. Malintang, BÜNNEMEYER 3890 (B), 3865 (B) — G. Talang, Laras Talang, BÜNNEMEYER 5602 (L) — G. Merapi, BÜNNEMEYER 4570 (L), 4522 (B), 4754 (B), MATTHEW s.n. (K) — G. Koerintji, BÜNNEMEYER 10255 (L), 10316 (L), 9125 (B, L), 9169 (B), 9668 (B), 8066 (B), 8848 (B), 10426 (B), 10550 (B), 10551 (B), 9861 (B) — id. S. Kembang, ROBINSON and KLOSS s.n. (K, Br. M.) — id., Barong Baroe Sapan, ROBINSON and KLOSS s.n. (K, Br. M.) — id., Koerintji Peak, ROBINSON and KLOSS s.n. (Br. M.) — Fort de Kock, YATES 2425 (L) — Padang Pandjang, MATTHEW s.n. (K); *Tapanoeli*: det. MIQUEL s.n. (U); *Bengkoelen*: along K. Soempang loenik, VAN DER PIJL 339 (B) — Pesagi, DE VOOGD 1542 (L); *Palembang*: G. Dempoe, AJOEB 422 (B); *Lampongs*: Tangamoes, DE VOOGD 170 (B).

Java: *West Java*: G. Tangkoeban Prahoe, JUNGHUHN s.n. (L), KORTHALS s.n. (L) — G. Boerangrang, Wanajasa, BACKER 14470 (L), BAKHUIZEN VAN DEN BRINK 4781 (L) — G. Boerangrang, BAKHUIZEN VAN DEN BRINK 4333 (L) — Tjibodas, BOERLAGE s.n. (L), SAPIIN 511 (B), DE MONCHY s.n. (B), HALLIER 382 (L), 449 (B), RAAP 661 (L) — Tjimahi, KORTHALS s.n. (L) — G. Gede, BLUME 443 (L) — id. south slope, BACKER 14981 (B) — id. Telaga Warna, HOCHREUTINER 1199 p.p. (G) — G. Mengamendoeng, coll. unknown (L) — G. Salak, west slope, LAM 2241 (L) — Geger Bintang, G. Pangerango, VAN STEENIS 5002 (B) — P. Patoeha, LÖRZING 1360 (B) — P. Sarie, Bantam, BLUME s.n., sub nomine *Lavenia intermedia* (L) — G. Karang, KOORDERS 40699 (L, B); *West Java*, PLOEM s.n. (L); *Middle Java*: G. Slamat, south slope, BACKER 313 (B) — G. Rogodjembangan, BACKER 16174 (B) — Dieng-plateau, BACKER 21768 (B); *East Java*: G. Lamongan, ALTMANN 155 (B) — G. Hijang, ZOLLINGER 792 (B) — Ringgit Tjoerah Oedang, CLASON-LAARMAN F 29 (B); Java, HORSFIELD s.n. (U), 71 (K), mixed up with *Adenostemma Lavenia*, BLUME s.n. (L).

L o m b o k: ZOLLINGER s.n. (L).

B o r n e o: *Br. N. Borneo*, G. Kinabaloe, GIBBS 4118 (K, Br. M.) — id., Marai Parai, CLEMENS 32424 (B); id., Bambang river, CLEMENS 34234 (B).

C e l e b e s: *S.W. Celebes*: G. Bonthain, BÜNNEMEYER 11841 (L), 11243 (L), 11618 (B), TEYSMANN 14083 (B) — Lombasang, BÜNNEMEYER 11713 (L), 11163 (B), 11820 (B), 11821 (B).

M o l u c c a s: *Ceram*, Hatoemete, KORNASSI 592 (L); *Boeroe*, TOXOPEUS 113 (L).

Flowers white (ZOLLINGER a.o.), creamy green (CLEMENS), pink (ROBINSON and KLOSS); central flowers yellow, external ones white (BÜNNEMEYER); Herb 120 cm high (TOXOPEUS).

Vernacular names. *kĕdjo bĕjar* (Java), *sroenem, katjang katjang babu, bajam oelang, oempoeet tjt babat* (all Sumatra).

Hab.: in primeval and other forests, in jungles, along a river, on steep slopes; in shady, moist localities; common, one or more together, scattered.

Altitude: 600—3000 m.

Flowers during the whole year.

Distribution: Bengal!, Sikkim!, Assam!, Mal. Penins.!.

The size of the leaves in this species is very variable. Some of the specimens from Celebes have double serrate leaves. Many of the Sumatran specimens have small ovate-oblong leaves, long tapering at both ends; petioles 1 cm long; blades 4—11 cm long, 1½—3½ cm broad. A specimen has been collected in Atjeh, VAN STEENIS 5951 (B), with leaves, that are scarcely pilose above (hairs thick, short) and on the nerves beneath.

Much allied to this species is *Adenostemma reticulatum* DC. Prod. V (1836) 113 (Herb. WIGHT 1540! and 1541!) = *Adenostemma viscosum* FORST. var. *reticulatum* DC. in CLARKE Comp. Ind. (1876) 30, which differs by the much larger heads and the leaves, which are deltoid-ovate, always coarsely double-serrate, nearly always hirsute beneath; the style-branches are less exserting. In both species the achenes are black, glandular, afterwards quite smooth. Distribution of *Adenostemma reticulatum* DC.: Ceylon!, Madras!, Assam!, Burma!, Mal. Penins.!.

Another species, much related to *Adenostemma macrophyllum* is *Adenostemma mauritianum* DC.! from Africa! and the Mascarenes!, but the blades of this species are hirsute with spreading hairs and the heads are larger.

(5) **Adenostemma Renschii** nov. spec. — Pl. III, 50—51.

Herba magna, plus quam ½ m alta. *Caulis* subteres, parce striatus, glanduloso-verruculosus, scabride et breviter hirsutus, 6 mm crassus, internodiis 4½—5½ cm longis, ramis subangulatis, 4 mm crassis. *Folia* opposita, petiolata (petiolis 1½—3½ cm longis), acute serrata (dentibus deltoides, apice callosis) parte inferiore integra, apice breviter acuminata et subacuta, basi abrupte attenuata, deltoidea, acuta, chartacea, laminis late rhomboideo-ovatis, utrinque dense breviter et scabride hirsutis, pinninerviis (nervis lateralibus 8, subtus prominentibus, extremis, reticulatis,

5—12 cm longis, 3—8½ cm latis. *Inflorescentia* paniculata, terminalis; ramis apicem versus decrescentibus, dense hirsutis (pilis ferrugineo-striatis, crispis), glandulosis, basi bractea foliacea praeditis; inferioribus in parte superiore ramosis. *Capitula* homogama, hemi-globosa, pedunculata (pedunculis ½—2½ cm longis dense ferrugineo-hirsutis, ½ mm crassis), interdum basi bractea lineari praedita, 25-flora, 6 mm longa, 8 mm crassa. *Involucrum* patelliforme, 1—2-seriatum, squamis 14—18, elliptico-oblongis, apice acutis, hirsutis, 3 mm longis, paulo minus 1 mm latis. *Flores* bisexuales. *Corolla* subtubulosa, apice obliqua, glandulosa (glandulis prominentibus) 5-lobata, 1½ mm longa, limbo anguste campanulato, lobis deltoideis, apice acutis, parce tomentosis, tubo limbo breviore, crasso. *Stylus* 3 mm longus, ramis apice sensim incrassatis, 1½ mm longis. *Antherae* oblongae, apice obtusae, basi subsagittatae. *Achenium* oblongo-obovatum, leviter curvatum, glabrum, glandulis sparsis praeditum, 2½ mm longum. *Pappi* setae 3, ½ mm longae, parte inferiore maiore incrassata, glandulosa, basi annulo crasso connatae. *Receptaculum* planum, alveolatum.

Distribution in the Malay Archipelago:

Flores: Geli Moetoe, RENSCH 1500 (B), type specimen.

Flowers white (RENSCH).

From most other Malayan species at once to be distinguished by the glabrous achenes with scattered glands; from *Adenostemma macrophyllum* to be distinguished by the densely hirsute leaves, the bilateral symmetric corolla, etc.

Hab.: in Casuarina forests; fairly many.

Altitude: 1500 m.

Flowers: July.

Doubtful species: *Adenostemma rufescens* SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 120; MIQ. Fl. Ind. Bat. II (1856) 26; BOERL. Fl. Ned. Ind. II (1899) 236. No description of this species seems to exist and not a single specimen has been found in one of the herbaria examined.

II. *AGERATINAE* HOFFM. l.c. 132, 133; *Agerateae* BENTH. et HOOK. l.c. 165, 172.

Anthers appendiculate at the top; style-branches semicylindric, equal, obtuse or subobtuse at the top.

Key to the genera.

1. a. More than 4 flowers in a head 2
   Heads consisting of 4 flowers . . . . 11. **Mikania**, p. 503
2. a. Pappus setaceous; setae numerous, filiform, scabrid. 10. **Eupatorium**, p. 492
   b. Pappus consisting of 5 or 10—20 narrowly paleaceous setae, acuminate at tip . . . . 9. **Ageratum**, p. 484

9. AGERATUM.

AGERATUM L. Gen. Pl. ed. I (1737) 247; BL. Bijdr. (1825) 906; LESS. Syn. Comp. (1832) 155; ROXB. Fl. Ind. (1832) 415; DC. Prod. V (1836) 108; MIQ. Fl. Ind. Bat. II (1856) 22; BENTH. Fl. Austr. III (1866) 462; BENTH. et HOOK. Gen. Pl. II (1873—1876) 241; CLARKE Comp. Ind. (1876) iii; OLIVER Fl. trop. Afr. III (1877) 300; HOOK. Fl. Br. Ind. III (1882) 243; BAILLON Hist. Pl. VIII (1886) 130; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 137; BOERL. Fl. Ned. II (1899) 174; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV (1905) 29; ELMER Leafl. Phil. Bot. I (1906) 99; KOORDERS Exc. Fl. III (1912) 317; RIDLEY Fl. Mal. Penins. II (1923) 182; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 500; LEMÉE Dict. Genr. I (1929 119.

Erect herbs. *Leaves* petiolate, ovate, dentate. *Heads* corymbose or loosely paniculate, many-flowered, subglobose. *Involucre* campanulate, 2—3-seriate; scales linear acute and acuminate at the top. *Corolla* tubular, 5-fid. *Anthers* having an appendage at the top. *Style*-branches slender, long, obtuse and pubescent at the top. *Achene* oblong, 5-angular. *Pappus* uniseriate; setae 5 or 10—20; narrowly paleaceous, acuminate at the top. *Receptacle* naked, more or less convex.

About 60 species in trop. America (S. North America, Central and South America); one in trop. Africa and one in Cochinchina.

Key to the species.

1. a. Leaves ovate, rhomboid ovate or deltoid ovate. Heads 60—75-flowered. Involucre subglabrous. Corolla 1—1½ mm long . . (1) **A. conyzoides.**
 b. Leaves deltoid. Heads 75—100-flowered. Involucre hirsute. Corolla 2—3 mm long; style branches long exserting the corolla. (2) **A. Houstonianum.**

(1) **Ageratum conyzoides** L. Sp. Pl. ed. I (1753) 839, ed. II (1863) 1175; WILLD. Sp. Pl. III (1804) 1773; DC. Prod. V (1836) 108; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 224; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 120; MIQ.! Pl. Jungh. (1854) 497; MIQ.! Fl. Ind. Bat. II (1856) 23; BENTH. Fl. Hongkong. (1862) 171; MIQ. Sumatra (1862) 210; BENTH. Fl. Austr. III (1866) 462; BAKER Fl. Bras. VI 2 (1873—1876) 194; CLARKE Comp. Ind. (1876) 30; KURZ in Journ. As. Soc. Beng. XLVI (1877) 197; HOOK. Fl. Br. Ind. III (1882) 243; FORBES et HEMSLEY in Journ. Linn. Soc. Bot. XXIII (1886) 403; CLARKE in Journ. Linn. Soc. Bot. XXV (1890) 36; KOORDERS in Meded. L. Pl. XIX (1898) 505; BOERL. Fl. Ned. Ind. II (1899) 236; CLARKE in Bot. Tidskr. XXIV (1902) 243; KING et GAMBLE in Journ. As. Soc. Beng.

LXXIV (1905) 29; HAYATA in Journ. Sci. Tokyo XXV (1908) 127; KOORDERS Exc. Fl. Java III (1912) 317; MERRILL Interpr. Rumph. Herb. Amb. (1917) 497; MERRILL Journ. R. As. Soc. (1921) 587; GAMBLE Fl. Madras IV (1921) 677; HUMBERT Comp. Madagascar (1923) 33; RIDLEY Fl. Mal. Penins. II (1923) 182; MERRILL Enum. III (1923) 597; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 500; RENDLE in Journ. Bot. LXIII (1925) suppl. 54; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1431; MATTF. in Engl. Bot. Jahrb. LXII (1929) 404; MERRILL! Pl. Elmer. Born. (1929) 301; ALSTON Suppl. Fl. Ceylon VI (1931) 160; BACKER Handb. Suikerr. Java VII (1932) 757; HOCHREUTINER in Candollea V (1931—1934) 299; *Olus scrofinum rubrum* RUMPH. Herb. Amb. VI (1750) 35; *Ageratum conyzoides* L. var. *pilosum* BL.! Bijdr. (1825) 906; *Ageratum cordifolium* ROXB.! Fl. Ind. III (1832) 415, leaves much pilose (this may be a variety, as DE CANDOLLE suggested).

Annual herb, 8—100 cm high. *Roots* crowded, much branched. *Stem* branched, terete, obscurely and irregularly ribbed, more or less hirsute (hairs spreading, grey), especially near the nodes and on the younger parts (hairs articulate), 1—5 mm thick; internodes 4—20 cm long; side-branches not branched; flowering branches often leafless, except the upper part. *Leaves* petiolate (petioles slender, hirsute, ½ mm thick, 2—50 mm long), more or less broadly ovate, deltoid-ovate, subrhomboid-ovate, elliptic-ovate, (higher ones deltoid-ovate), obtuse or subobtuse, sometimes long acuminate at the top, lower ones suddenly and shortly narrowed, acute at the base, higher ones abruptly cut off, nearly rounded at the base, membranous, paler beneath, serrate(teeth rounded or acute) or repandate, lower part entire, glandularly spotted, subglabrous (slightly hirsute on the nerves) or with spreading long hairs on both sides, pinninerved (lateral nerves 3—4 pairs, extreme ones reticulate), nearly 3-nerved from the base; blades 2—10 cm long, 1½—5 cm broad, higher ones smaller. *Heads* in small, terminal, more or less dense corymbs, consisting of 8—15 heads. Heads pedunculate (peduncle filiform, pubescent, gradually thickened to the top, 5—17 mm long, having about 4 alternate linear bracts at the base and higher on), subglobose, 60—75-flowered, 4—6 mm long and as wide. *Involucre* campanulate, 2—3-seriate; scales lanceolate, irregularly serrate at the superior part, acute and acuminate at the top, glabrous or with few hairs along the edges, 2—3-nerved (nerves prominent), 3 mm long, less than 1 mm broad, sometimes purplish at the upper part. *Corolla* infundibuliform small, 5-lobed, about as long as the pappus, 1—1½ mm long; lobes short, deltoid, broad. *Anthers* obtuse at the base, subacute at the top. *Style*-branches long, thickened to the top,

obtuse at the top, ciliate at the upper part, exceeding the corolla. *Achene* linear-oblong, clearly 5-angular, black, glabrous or sparingly strigose at the ribs, ½—2 mm long. *Pappus*-setae scale-like, 5, deltoid and fringed at the lower part, ending into a long prickle at the top, about as long as the corolla. *Receptacle* naked, convex, afterwards conical.

Distribution in the Malay Archipelago:

Sumatra: *Atjeh*: Gajoe and Alas districts, exped. VAN DAALEN s.n. (L), PRINGO ATMODJO 302 (B) — Alas-valley, LÖRZING 11110 (B); *East Coast*: Medan, LÖRZING 3022 (B), 3561 (B), 3740 (B) — Asahan, Silau Meradja, BARTLETT and LA RUE 396 (L) — id. Slandi, BARTLETT and LA RUE 284 (L) — Pematang, Siantar, coll. unknown 7c (B), WINCKEL 1221 (B) — Serdang, LÖRZING 3416 (B) — Karo-plateau LÖRZING 8580 (B), 6292 (B) — id. near Raja, LÖRZING 4876 (B), id., Sarinembah, GALOENGI 7 (B) — south of Tebingtinggi, LÖRZING 7395 (B) — north of the Toba-lake, LÖRZING 9772 (B); East Coast, DOCTERS VAN LEEUWEN 3168 (B); *Tapanoeli*: Toba, Lagoe roti OUWEHAND 10 (B) — id., Bahal Batoe, near Siborong Siborong, HUITEMA 4 (B) — N.W. of the Toba-lake, G. Siboeatan, foot, LÖRZING 7177 (B) — Samosir, Toba-lake, LÖRZING 7696 (B) — Habinsaran-plateau, E.S.E. of Toba-lake, LÖRZING 6473 (B) — P. Roepat, BRUINIER 26 (B); *West Coast*: G. Koerintji, BÜNNEMEYER 7933 (U, B), 9149 (L), ROBINSON and KLOSS 119 (Br. M.) — id. Barong baroe japan, ROBINSON and KLOSS s.n. (K) — id. S. Kembang, ROBINSON and KLOSS s.n. (K) — Fort de Kock, JACOBSON s.n. (B), 2054 (B), BÜNNEMEYER 1335 (B) — Padang, coll. unknown 215 (B) — id. N. Temaja, HENDERSON 20486 (B) — G. Merapi, BÜNNEMEYER 4809 (L) — G. Talamau, BÜNNEMEYER 1017 (L) — Ophir district, Laeb Sikaping, BÜNNEMEYER 1223 (B) — G. Talang, Laras Talang, BÜNNEMEYER 5096 (L) — G. Singgalang, BÜNNEMEYER 2590 (B) — Taloe, BÜNNEMEYER 146 (B) — Mangani, BÜNNEMEYER 3034 (B); *Lampongs*: Talang batoe, IDENBURG 39 (B) — Menggala, Goenoengtapa, IDENBURG 8 (B) — G. Rate Telanggaran, IBOET 99 (L); Palembang, S. Malanbetoeng, SZEMIAN 31 (L, B) — Martapoera, BAL 25 (B) — Palembang-Lampongs, SZEMIAN 8 (B); *Djambi*: near Bangko, POSTHUMUS 459 (L, B); Sumatra, Tanang Taloe BÜNNEMEYER 1040 (L); Sumatra, HEYNE s.n. (Br. M.).

Simaloer: near Sumatra, ACHMAD 306 (L).

Nias: near Sumatra, VAN RÖMER s.n. (B).

Batoe Islands: near Sumatra, Ladan T. Mana, RAAP 142 (B).

Bangka: KOBUS s.n. (B), AMAND s.n. (U) — S. Liat, Batem, BÜNNEMEYER 1606 (L) — Muntok, BÜNNEMEYER 1367 (L).

Riouw Arch.: *P. Bintan*, G. Bintan, BÜNNEMEYER 6107 (L) —

Laban, Bünnemeyer 6251 (L) — *P. Oedjan*, Bünnemeyer 6443 (B) — *P. Papan*, Bünnemeyer 7817 (B) — *P. Soegi bawah*, Bünnemeyer 7715 (B).

Lingga Arch.: *P. Lingga*, Bünnemeyer 6641 (L, B), 7041 (B) — *P. Singkep*, Bünnemeyer 7102 (B) — *P. Selajar*, Bünnemeyer 6563 (B), 7432 (B) — *P. Sebangka*, Bünnemeyer 7489 (B).

Anambas and Natoenas Islands: *P. Siantan*, east of Trempa, van Steenis 771 (L, B) — *P. Sedanan*, Genting, van Steenis 1042 (B).

Java: *West Java*: Buitenzorg, Koorders 32615 (L), coll. unknown (K), van Steenis 80 (B), de Monchy s.n. (B), Hallier 158g (B), 159a, b, c (B), Bakhuizen van den Brink 1023 (B), 3816 (B), Reinwardt s.n. (L), Soegandiredja 93 (B) — between Batavia and Buitenzorg, coll. unknown (K) — near Pandaglang, Backer 26077 (L) — Depok, Koorders 44160 (L), 41683 (L), 31291 (B) — near Palaboean Ratoe, Soekaboemi, Winckel 1865 (L) — Tjiratjap, Soekaboemi, Backer 17408 (B) — Bodjong terong near Tjibadak, Soekaboemi, Aarts 33 (B) — South of Soekaboemi, Backer 14590 (B) — Bodjong Lopang, south of Soekaboemi, Backer 16934 (B) — Palaboean, Soekaboemi, Koorders 34650 (B) — north of Tjiandjoer, Zwaardemaker 8 (B), 40 (B), Backer 23572 (B) — Batavia, van der Veen s.n. (L), Sprée s.n. (L) — Weltevreden, Junghuhn s.n. (L), 376 (L), Backer 21340 (B), 21341 (B), 21339 (B), 21350 (B) — Batoetoelis near Buitenzorg, Raap 8 (L), Backer 21347 (B) — Tjiherang, N.E. of Masing, Buitenzorg, Bakhuizen van den Brink 5782 (L) — Tjiomas, west of Buitenzorg, Went s.n. (U) — S.W. of Masing, Buitenzorg, Bakhuizen van den Brink 5561 (B) — Tjilengsie, Buitenzorg, Frijlink 5 (B) — near Tjampea, Buitenzorg, Koorders 31476 (B) — Dago, Buitenzorg, Koorders 47987 (B) — Tjibodas, Koorders 31713 (L), Hallier 636 (B) — Djasinga, Backer 10058 (B) — Takoka, Tjiandjoer, Koorders 15094 (L) — Garoet, Koorders 26495 (B), Burck s.n. (B), very small specimen, 5 (B), Koens 1 (B), 2 (B), 45 (B) — between Garoet and Tjipanas, Backer 5197 (B) — G. Salak, Blume s.n. (L), sub var. *pilosum*, Blume s.n. (L), Backer 9325 (B) — G. Pangerango, Junghuhn s.n. (L) — Tjidadap, Tjibeber, Bakhuizen van den Brink 2983 (L) — south of Tjibeber, Leuwimanggoe, Sihaya s.n. (B) — Taloen near Bandoeng, Pulle 3118 (U) — Bandoeng, Lörzing 1134 (B), coll. unknown (B) — Poerwakarta, Harmsen 52 (B), Backer 13906 (B) — Goenoengkantjana, Koorders 41204 (B) — Noesa gede in the lake of Pendjaloe, Tasikmalaja, Koorders 47988 (B) — Nirmala, Backer 10657 (B) — Lembang, Paravicini s.n. (B) — near Tjikampek, Krawang,

BEUMÉE 4596 (B) — P. Noordwachter, north of Batavia, BOSCHMA 66 (B) — G. Patoeha, Kantja, LÖRZING s.n. (B) — Tjimahi, HEERING s.n. (B) — Java's eerste punt, Bantam, BACKER 21349 (B) — Tjipetir, DE MONCHY s.n. (B) — Bandjar, BACKER 21355 (B) — G. Boekittoengoel, DE MONCHY 49 (B) — G. Boerangrang, BACKER 14255 (B) — Tjiloa, Zandbaai, BACKER 943 (B) — Pandaglang, BACKER 7411 (B) — Sadjira Lebak, BACKER 2030 (B) — Malingping, Lebak, BACKER 1424 (B); West Java, FORBES s.n. (Br. M.); *Middle Java*: Keboemen, BRINKMAN 36 (B) — Karanganjar, KOORDERS 2620 (L) — Bandjarnegara, KOORDERS 27116 (B) — on the Boroboedoer, KOORDERS 36654 (B), 36688 (B) — Pelemojo, Semarang, KOORDERS 27692 (L) — Tajoe, Ngarengan, Djoewana, KOORDERS 33496 (B), 34931 (B) — Sipakoeng, Ambarawa, KOORDERS 35906 (B) — Poerworedjo, LEEFMANS 92 (B) — Poerwkerto, BACKER 16 (B) — Madjenang, BACKER 18433 (B) — Soebah, Batang, BEUMÉE 4292 (B) — Salatiga, BACKER 30137 (B) — between Slawi and Balapoelang, BACKER 15390 (B) — Garoeng, Wonosobo, BACKER 21983 (B) — Oengaran, DOCTERS VAN LEEUWEN—REIJNVAAN s.n. (B) — between Doro and Bandar, Pekalongan, BACKER 15565 (B) — between Sirangkel and Dieng, BLOKHUIS 60 (B) — south of Blora, BLOKHUIS s.n. (B) — near Pati, BEUMÉE 634 (B) — East Tegal, BEUMÉE 3650 (B) — Dieng-plateau, BACKER 21759 (B) — Margasarie, Brebes, BEUMÉE 195 (B) — Tegal, coll. unknown (B) — Temanggoeng, LÖRZING 343 (B); *Soerakarta*: Bojolali, BEGUIN 65 (B) — Klaten, coll. unknown (B), LEEFMANS 129 (B) — Solo, HEMKEN s.n. (B); *East Java*: G. Tengger, BUIJSMAN 2771 (U), VAN HARREVELD—LAKO 88 (B), 23 (B) — Djember, Sempol Kalisat, KOORDERS 43306 (L) — Pantjoer, Sitoebondo, KOORDERS 15437 (B), OTTOLANDER 248 (B) — G. Lawoe, ELBERT 23 (L), BEUMÉE 2228 (B) — G. Wilis, LÖRZING 875 (B) — Soemberwaroe, Panaroekan, KOORDERS 43887 (B) — Kalibendo, KOORDERS 43307 (B) — Poeger, KOORDERS 20564 (B) — Southern hills, Malang, KOORDERS 23076 (B) — Malang, HOFSTEE 41 (B), VERHOEF 20 (B) — S.W. of Gondang, Malang, BACKER 3543 (B) — Ngawi, STOUTJESDIJK 3 (B) — Kepandjen, Soerabaja, ISMAIL 5 (B) — Toeloengagoeng, BACKER 11684 (B) — South Kediri, KRAMER 58 (B), 143 (B) — Djember, ULTÉE s.n. (B) — Amboeloe, Djember, BACKER 18179 (B) — Sitoebondo, BACKER 24460 (B), G. Idjen, BACKER 24886 (B) — G. Baloeran, BACKER 24784 (B) — Djatiroto, BACKER 7959 (B) — G. Smeroe, BACKER 3783 (B) — Paiton, near Kraksaän, BACKER 12987 (B) — G. Argopoeroe, BACKER 13152 (B) — Pasoeroean, BACKER 7682 (B) — G. Pandan, THORENAAR 8 (B) — Rembang, BEUMÉE 5299 (B), 5211 (B), 937 (B) — Goen, Pasoeroean, WISSE 326 (B) — South Soerabaja, BEUMÉE 2438 (B) —

Gadoengan, Wlingi, Blitar, Koorders 22963 (L); Java, Zollinger 23 (L), Waitz s.n. (L).

Madoera: Bangkalan, Backer 19357 (B) — Sampang, Backer 19705 (B) — N.W. of Rapa, Backer 20265 (B).

Karimondjawa Islands: *P. Kamodjan*, Koorders 161 (B).

Kangean Arch.: *P. Kangean*, Backer 27591 — Ardjasa, Backer 26869 (B) — Kajoewaroe, Backer 28003 (B); *P. Saoebi*, Backer 28228 (B); *P. Paliat*, Backer 29337 (B); *P. Saeboes*, Backer 29156 (B); *P. Sepandjang*, Backer 28794 (B); *P. Mamboerit*, Backer 27302 (B); *P. Saboenten*, Backer 29692 (B); *P. Sepapan*, Backer 28542 (B).

Lombok: G. Rindjani, Tengwall 23 (L, B) — Segare Anak, Rensch 256 (B) — Narmada, Rensch 51 (B).

Soembawa: Soembawa besar, Rensch 481 (B).

Flores: Aboera, de Jong 9 (B) — Roeteng, Knaap 21 (B).

Timor: Boerain, S.E. of Koepang, Straub G 1 (B).

Christmas Island, south of Java, Andrews 48 (K).

Borneo: *Br. N. Borneo*: Sandakan, Elmer 20300 (L, Br. M., K), Zeano 2360 (K), Creagh s.n. (Br. M., K) — Tawao, Elmer 20731 (L, K, Br. M.) — G. Kinabaloe, Clemens 11239 (K) — Sarawak, Beccari 824 (K); N. Borneo: Burbidge s.n. (Br. M.), id. Tikoeng, Amdjah 777 (L); *West Borneo*: Papar, Ketapang, Clemens 11239 (B); *S.E. Borneo*: Banjermasin, Motley 294 (K) — Pagatan, Grabowsky s.n. (Br. M.) — Pembliangan, Amdjah 833 (L, K); Borneo, Haviland 3023 (K).

Celebes: *Manado*: Koorders 16418 (B), 16419 (L), 16420 (B) — Koelawi, Paloe, Posthumus 2304 (B) — near Karoewatoe, Koorders 16417 (B) — Lindoe lake, Donggala 23 (B) — Gorontalo, Riedel s.n. (K) — Goeroepahi, Kaudern 82 (L); *S.W. Celebes*: Makassar, Barclay s.n. (Br. M.) — G. Bonthain, Bünnemeyer 11609 (L), 12119a (B) — Bonto Parang, Bünnemeyer 10557 (L) — Malino, Bünnemeyer 10719 (B) — Malakadji, N.W. of Bonthain, Bouman—Houtman 56 (B); *S.E. Celebes*: P. Boeton, de Boer 14 (B).

P. Tanah Djampea, south of Saleier, Docters van Leeuwen 1605 (U).

Talaud Islands: P. Karakelang, east of Beo, Lam 2604 (B).

Moluccas: *Amboina*, Robinson 428 (L, K); *Ternate*, Beguin 895 (B); *Ceram*, Central Ceram, Kornassi 1394 (B) — near Wai Nalaf, Rutten 1584a (B) — Roho, Rutten 505 (L) — Kilmoeri, Rutten [illegible]1 (L).

Flowers white (Zwaardemaker a.o.); violet (Hallier a.o.), [illegible]rty pink (Koorders); plant smelling badly (Koorders), leaves smelling of [illegible] (Bünnemeyer), having a smell of goats (ex Matt. l.c.).

Vernacular names: *babandotan, djoekoet baoe, rantèn, tjemamem, bandotan, orang aring, madoesan, (does) wedoesan, gleton* (all Java); *poeti, roempoet sapi, salembanjo, wimbe, roekoet weroe, halibangoe, lawet rinteh* (all Celebes); *roempoet rungit, roempoet weng, garang garang djau, silamboei, siamis, toeawa, toeloh dagang, djoekoehoerang, roempoet kambing, roempoet amih, roempoet njoekoe hoewong, roempoet boesoek* (all Sumatra); *lalap-belembang* (Bangka); *djelatang ajam, daoen boeloe* (both Lingga Arch); *radoeoetoe manaro, roempoet manado* (Talaud); *selisip babi* (Brneo), *daoen kambing, roekoe bambe, roempoet tai babi* (all Mal.).

Hab.: in primeval, teak and other forests, jungles, grassy fields, rice fields, gardens, on banks of rivers, along ditches, lakes and canals, in fields of sugar cane, coffee, Hevea, Cinchona, tea, potatoes, in Coconut-gardens, along waysides, near the beach, on a factory-ground; on clay, on a stony soil, on marly limestone, on a sandy soil, on weathered tuff; on a dry or a moist soil; very common, few to abundant.

Altitude: 0—2100 m.

Flowers during the whole year.

On of the commonest weeds (cf. BACKER l.c.). Often creeping and with rooting stems (LÖRZING); heads often bent down (BLOKHUIS); leaves thin, pale green, dull above, slightly glossy beneath (HALLIER).

Use: Leaves against itch and wounds in P. Sinkep, Lingga Arch., (acc. to BÜNNEMEYER); used by the natives in case of boils, and when bitten by a dog or a crocodile (BORNEO); a medicine against stomach ache.

Distribution: Trop. Asia: Ceylon!, Madras!, Punjab!, Nepal!, Himalaya!, Bengal!, Sikkim!, Assam!, Burma!, Cambodge!, Cochinchina!, Tonking, Laos, Siam!, Annam!, Mal. Penins.!, China (Yunnan!, Hongkong!, Fukien!, Canton!), Formosa, Japan (Kioochoo!), Philippines (Luzon!, Leyte!, Culion!), New Guinea!; Polynesia: Marianne Islands!, Samoa Islands!, Hawaian Islands!, New Caledonia!, Carolines!, Tonga Islands!; Africa: (all over, also Egypt), Madagascar!, Seychelles!, Mauritius!; Trop. South America: Brazil!, Venezuela!, Colombia!, West Indies!, Guyana!, Bolivia!, Nicaragua!; U.S.A.: Georgia!.

A common weed in all hot countries, of American origin.

(2) **Ageratum Houstonianum** MILL. Dict. ed. 8 n. 2 (1768); ROBINSON in Proc. Am. Ac. XLIX (1913) 459; *Ageratum Mexicanum* SIMS. Bot. Mag. (1825) t. 2524; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 137; *Ageratum conyzoides* var. *mexicanum* DC. Prod. V (1836) 108.

Herb, 16—60 cm high, rooting at the lower part. *Stem* subterete, 2—7 mm thick, branches sparsely hirsute, glandular, purplish; very short ones in the axils of the leaves; internodes 2—6 cm long. *Leaves* petiolate (petioles whitish hirsute, ½—6½ cm long), deltoid (upper ones ovate), obtuse or subacute at the top, very shortly acute at the base, serrate, membranous, pinni-nerved (nearly 3-nerved at the base, about 3 pairs of lateral nerves), hirsute at both sides; blades 2—10 cm long, 1½—5½ cm broad. *Heads* in terminal and axillary corymbose panicles, on more or less long peduncles. Heads pedunculate (peduncles 2—6 mm long, campanulate, 5½—7 mm long, 6½—8 mm wide. *Involucre* cam-

panulate, biseriate, 3½—4 mm long; scales lanceolate, long pointed at the top, 2-nerved (nerves prominent), glandular, greyish hirsute (hairs long, flexible, fine), ½ mm broad. *Corolla* infundibuliform, 2½—3 mm long; limb narrowly campanulate, 5-fid at the top, slightly pubescent or subglabrous; lobes deltoid, short, acute at the top, pubescent; tube slender, about as long as the limb, glandularly pubescent. *Anthers* obtuse at the base, subacute at the top. *Style*-branches subglabrous, long exserting the corolla. *Achene* linear-oblong, 5-angular, black, sparingly strigose, 1½ mm long. *Pappus* consisting of 5 paleaceous setae, deltoid and fringed at the basal part, ending into a long needle at the top, about as long as the corolla. *Receptacle* convex, afterwards conical, alveolate.

Distribution in the Malay Archipelago:

Sumatra: *East Coast*: Brastagi, near Medan, Lörzing 8237 (B).

Java: *West Java*: Tjiherang, N.E. of Masing, Buitenzorg, Bakhuizen van den Brink 5781 (L, K) — Tjipakantjilan, Buitenzorg, Bakhuizen van den Brink 2006 (B) — Masing, G. Gede, Bakhuizen van den Brink 2888 (B) — G. Patoeha, Telaga Patengan, Priangan, Leefmans s.n. (B), Backer 12532 (B) — Pengalengan, Backer 26077 (L) — Tjibodas, Koorders 31713 (L), Lörzing 2408 (B), Backer 22330 (B) — G. Salak, Raap 150 (L) — Buitenzorg, Bakhuizen van den Brink 1024 (B), van Steenis 1801 (B) — G. Gede, Bakhuizen van den Brink 716 (B) — Soekaboemi, de Visser Smits s.n. (B), Backer 14620 (B) — G. Kendang, Priangan, Koens 184 (B) — Sindanglaya, Priangan, Backer 13500 (B) — G. Tjikorai, Pasir Kolotok, Backer 8692 (B) — G. Mandalagiri, Lam 132 (B), van Vuuren s.n. (B) — Tjiandjoer, Backer 3139 (B) — Kartamana, Priangan, Smith 639 (B) — Tjinjiroean, Bandoeng, Backer 5724 (B), 5712 (B), Rant 3 (B), coll. unknown s.n. (B) — Tjibeureum, near Bandoeng, Docters van Leeuwen s.n. (B), van Steenis 1921 (B); *East Java*: Ploasan, Magetan, Wisse 68 (B) — Nongkodjadjar, Wisse 624 (B) — G. Andjasmoro, Soerabaja, Winckel 197 (B).

Flowers purple (Lörzing, Lam), pale blue (van Steenis).

Vernacular names: *babandottan, babadotan woengoe, wedoesan* (all Java).

Hab.: along waysides, in fields, in tea, coffee and Cinchona gardens, along ditches; in sunny localities; few to numerous, very common.

Altitude: 200—1650 m.

Flowers during the whole year.

Distribution: Trop. Asia: Madras!, Assam, Philippines (Luzon!), New Caledonia!; Central and N. South America (Mexico!, Costa Rica, Guatemala, Brazil!, West Indies, Guyana).

Originally from America, introduced into Java and Sumatra.

10. EUPATORIUM.

EUPATORIUM Tourn. Inst. (1700) 455 t. 259; Bl. Bijdr. (1825) 902; Less. Syn. Comp. (1832) 157; Roxb. Fl. Ind. III (1832) 414; DC. Prod. V (1836) 141; Miq. Fl. Ind. Bat. II (1856) 26; Benth. Fl. Austr. III (1866) 461; Benth. et Hook. Gen. Pl. II (1873—1876) 245; Clarke Comp. Ind. (1876) iii; Oliver Fl. trop. Afr. III (1877) 300; Hook. Fl. Br. Ind. III (1882) 243; Baillon Hist. Pl. VIII (1886) 128; Hoffm. in Engl.-Prantl Nat. Pfl. IV 5 (1894) 138; Boerl. Fl. Ned. Ind. II (1899) 175; Elmer Leafl. Phil. Bot. I (1906) 101; Koorders Exc. Fl. Java III (1912) 317; Gagnep. in Lec. Fl. Indo-Chine III (1924) 505; Lemée Dict. Genr. III (1931) 44.

Herbs or shrubs. *Leaves* dentate or entire; very rarely alternate. *Heads* few- to many-flowered, small to rather large, often corymbose. *Involucre* one- to manyseriate, loosely or appressedly imbricate. *Corolla* infundibuliform or having a campanulate limb, never yellow. *Anthers* appendiculate at the top, obtuse (rarely subsagittate) at the base. *Style*-branches usually long, obtuse at the top, pubescent, long exserting. *Achene* oblong, 4—5-angular, truncate at the top, glabrous or having ciliate ribs. *Pappus* setaceous, uniseriate; setae numerous, filiform, scabrous. *Receptacle* naked or pubescent, flat or slightly convex.

About 1200 species in Europe, Asia, Africa, but chiefly in Central and South America.

Key to the species.

1. a. Leaves sharply serrate. Involucrum 2—3 seriate. Heads 5-flowered . 2
   b. Leaves serrate or entire. Involucrum 1—4-seriate. Heads many-flowered 4
2. a. Leaves 3-nerved. Involucral scales acute . . (4) **E. nodiflorum.**
   b. Leaves pinni-nerved. Involucral scales obtuse or subacute 3
3. a. Herb. Leaves glabrous. Achene pubescent . . (5) **E. Horsfieldii.**
   b. Shrub. Leaves shortly pubescent. Achene subglabrous . . . . . . (6) **E. Toppingianum.**
4. a. Herb. Leaves entire. Heads paniculate . . . (1) **E. triplinerve.**
   b. Shrub (sometimes herb). Leaves serrate or dentate and entire at the inferior part. Heads corymbose 5
5. a. Leaves 3-nerved at the base, glabrous. Involucrum 1—2-seriate; scales equal . . . . (7) **E. riparium.**
   b. Leaves pinni-nerved, pubescent, scabrid or glabrous. Involucro 3—4-seriate; scales gradually shorter to the exterior ones 6
6. a. Leaves subglabrous beneath. Heads 8—12 mm wide, 7—10 mm long. Involucrum 4-seriate; scales scabridly hirsute. (2) **E. sordidum.**
   b. Leaves fulvously pubescent beneath. Heads 4 mm wide, 6 mm long. Involucrum 3-seriate; scales pubescent . . . (3) **E. inulifolium.**

c. Leaves glabrous at both sides. Heads 6 mm wide, 5 mm long. Involucrum 3-seriate; scales having stalked glands along the margins . . (8) **E. adenophorum.**

I. Sectio **Subimbricata** DC. Prod. V (1836) 152; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 140; *Heterolepis* BAKER Fl. Bras. VI 2 (1873—1876) 301.

Involucrum 3—4-seriate (according to HOFFM. 2—3-seriate), ovate or campanulate, (often loosely) imbricate. *Receptacle* flat.

(1) **Eupatorium triplinerve** VAHL Symb. III (1794) 97; WILLD. Sp. Pl. III (1804) 1769; BL.! Bijdr. (1825) 903; BAKER Fl. Bras. VI 2 (1873—1876) 306; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 140; MERRILL in Journ. R. As. Soc. (1921) 587; MERRILL Enum. Phil. III (1923) 598; *Eupatorium ayapana* VENT. Hort. Malm. II (1804) t. 3; WILLD. Sp. Pl. III (1804) 1769; DC. Prod. V (1836) 169; ZOLL. in Nat. Gen. Arch. Neêrl. Ind. II (1845) 228; SCH.-BIP. in ZOLL. Syst. Verz. Ind. Arch. (1854) 120; MIQ.! Fl. Ind. Bat. II (1856) 26; MIQ. Sumatra (1862) 210; HOOK. Fl. Br. Ind. III (1882) 244; BOERL. Fl. Ned. Ind. II (1899) 236; KOORDERS Exc. Fl. Java III (1912) 318; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 507; HEYNE Nutt. Pl. Ned. Ind II (1927) 1432; BACKER Handb. Suikerr. Java VII (1932) 758.

Herb, 35—60 cm high; creeping and rooting at the lower part (roots numerous); *stem* terete, ribbed, glabrous, slightly pubescent on the upper part, 1½—3 mm thick; internodes 2—7½ cm long. *Leaves* subpetiolate (petioles 0—1 cm long), narrowly elliptic or lanceolate, more or less long acuminate at the top (tip acute or subobtuse), gradually attenuate into the petiole at the base, entire, coriaceous, 3-nerved (nerves diverging at about one third of the length, 3—4 pairs of small lateral nerves), quite glabrous at both sides, minutely glandular beneath, edges recurved, 6—11 cm long, ½—2 cm broad; upper ones gradually smaller, to 5—6 mm broad, 3—3½ cm long; small leafy side-branches in the axils of the leaves; two opposite leaves connected at the base. Leaves of the flowering branches more narrow than those of the sterile branches. Heads broadly paniculate; *inflorescence* thin, terminal and very short ones in the axils of the leaves; side-branches elongated, spreading(making angles of about 45 degrees with the principal axis), pubescent, in the axil of a small, linear, shortly pubescent leaf, heaving few (2—6) heads only at the very superior part and few small, linear, shortly pubescent leaves lower on, or leafless on the lower part; extreme branches dichotomous, slender. *Heads* pedunculate (peduncles slender, pubescent, 6—13 mm long, less than ½ mm thick, having minute bracts at the base and half-

way), campanulate, 20—50-flowered, 6—7 mm high, 5—6 mm wide. *Involucre* campanulate, 3-seriate, nearly as long as the flowers, 5 mm long; scales more or less spreading, gradually shorter to the exterior ones, about 30, linear, 1—2-nerved (nerves prominent), shortly pubescent, sharply acuminate and ciliate at the top. Flowers 6—7 mm long. *Corolla* infundibuliform, narrow, 5-lobed, 4—5 mm long, limb and tube not to be separated; lobes short, subacute. *Anthers* obtuse at both ends. *Style*-branches slender, pubescent, long, shortly exceeding the corolla. *Achene* narrowly oblong, 5-angular, slightly pubescent on the ribs, suddenly narrowed close to the top, 2 mm long. *Pappus* shorter than the corolla, 3 mm long; setae few, ciliate, white. *Receptacle* flat, alveolate, glabrous.

Distribution in the Malay Archipelago:

Sumatra (ex MIQUEL l.c., probably cultivated).

Java: *West Java*: Tji Handjawar, near Buitenzorg, BACKER 6255 (B) — south of Leuwiliang, Kratjak, BAKHUIZEN VAN DEN BRINK 3388 (L); *Middle Java*: Setro, near Petjangaän, N.W. of Moeriah, DOCTERS VAN LEEUWEN 774 (B, U); Java, BLUME s.n. (L, Br. M.), REINWARDT s.n. (L), ZOLLINGER s.n. (L), det. MIQ. s.n. (U), HORSFIELD 74 (K).

Borneo: coll. unknown (L).

Celebes: coll. unknown (L).

Flowers pink (DOCTERS VAN LEEUWEN, BAKHUIZEN VAN DEN BRINK); greenish white below, purplish pink at the top (ex BACKER l.c.); whitish (ex BACKER l.c.), violet (ex MIQUEL l.c.); style branches pink (BAKHUIZEN VAN DEN BRINK). Involucral scales yellowish green (Bakhuizen van den Brink), green and purple at the top (ex BACKER l.c.). Herb creeping or climbing (DOCTERS VAN LEEUWEN), to 1 mm high (ex BACKER l.c.); stem purplish (ex BACKER l.c.).

Achenes never develop in Java (ex BACKER l.c.).

Vernacular names: *tèklam, daoen fransman, daoen prasman, daoen panahan, djapono, godong prasman, djoekoet prasman* (all Java).

Hab.: in second growth forests; in a moist locality, in scattered groups.

Altitude: 300—400 m; 0—1600 m (ex BACKER l.c.).

Flowers: June, Sept., Dec.

Use: leaves (bitter) used to cure fevers, cold and diarrhoea; placed on the fore-head in case of head-ache (HEYNE). Used to heal the sting of poisonous snakes and as a sudorific remedy. In Java cultivated so as to prevent the soil of the tea gardens from being washed away by the rains (VAN HELTEN).

Distribution: Trop. Asia: Philippines (Luzon!); Africa: Mauritius (ex BAKER); South America (Brazil!, Guyana!, West Indies!, Trinidad!).

(2) **Eupatorium sordidum** LESS. in Linnaea VI (1831) 403; STANDLEY in Contr. U.S. Nat. Herb. XXIII (1926) 1453; *Eupatorium ianthinum* HEMSL. in Biol. Centr. Am. Bot. II (1881) 96 (ex STANDLEY l.c.); *Hebeclinum sordidum* SCH.-BIP.! (nomen nudum) in herb.

Shrub; *stem* subterete or subangular, scabridly rusty hirsute or rusty tomentose, 4—10 mm thick; internodes 2½—7 cm long. *Leaves* petiolate (petioles 2—9 cm long, 1—2½ mm thick, inconspicuously grooved, densely scabridly rustly hirsute), elliptic, broadly ovate-elliptic, cordate-ovate or broadly ovate, subacute at the top, acute or truncate at the base, minutely sharply serrate, entire at the basal part, warty, dark coloured and scabrid above, glandular, pale and subglabrous beneath, pinni-nerved (nerves prominent, scabridly hirsute or tomentose above, lateral ones 5—7 pairs, lower ones close together, extreme ones reticulated), chartaceous, occasionnally extremely large; blades 9—29 cm long, 4—23 cm broad; upper leaves sometimes deltoid-ovate, acuminate at the top. *Panicles* corymbose, dense, broad (17—30 cm wide), terminal and in the axils of the upper leaves, consisting of many heads; axis of the panicles long, leafless or nearly so, scabridly hirsute or tomentose; branches of the inflorescence more or less elongated, leafless, scabridly hirsute or tomentose, horizontally spreading. *Heads* pedunculate (peduncles long, scabridly hirsute or tomentose, 1—1½ cm long, ½ mm thick), campanulate, many-flowered, 7—10 mm high, 8—12 mm wide, having a small linear hirsute bract at base. *Involucre* campanulate, 4-seriate; scales about 20, gradually shorter to the exterior ones, acuminate and subobtuse at top; of the inner rows ovate-oblong, of the innermost row glandular at the inferior part, scabridly hirsute and ciliate at the superior part, 4 mm long, ½ mm wide; of the second and the third row scabridly hirsute, 2½—3½ mm long, 1 mm wide; of the extreme row linear, scabridly hirsute, 2 mm long, ½ mm wide. *Flowers* exceeding the pappus. *Corolla* infundibuliform, glabrous, 5-ribbed, 5-lobed, 5 mm long; lobes short, broadly deltoid, acute at the top. *Anthers* obtuse at both ends, thin. *Style*-branches long, filiform, slender, long exserting, acute at the top, 4 mm long. *Achene* linear-oblong, 5-angular, 5-ribbed, glabrous, 1½ mm long. *Pappus* white, shorter than the corolla; hairs unequal, numerous, hardly ciliate, 4—4½ mm long. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

J a v a: *West Java*: Tjibodas, SAPIIN 230 (L), KOORDERS 42064 (L), 42169 (B), BACKER 13509 (L), 22214 (B), 13548 (B), CLEMENS s.n. (K), LÖRZING 1840 (B), VAN STEENIS 1820 (B) — Tjibeureum near Bandoeng, DEN BERGER 606 (B) — Sindanglaja, BACKER 32403 (B), DEN BERGER s.n. (B) — Telaga Patenggan, BACKER 12524 (B), 12469 (B).

Flowers blue (CLEMENS); fragrant (ex STANDLEY l.c.); herb 1 m high (KOORDERS).

Hab.: along edges of forests, in a second growth forest, near waterfalls, on a pile of stones; few or many together.

Altitude: 1400—1700 m.
Flowers: March—Sept.
Distribution: Mexico!

(3) **Eupatorium inulifolium** H. B. K. Nov. Gen. Sp. IV (1820) 109; HOCHREUTINER in Candollea V (1931—1934) 299; *Eupatorium pallescens* DC. Prod. V (1836) 154; BAKER! Fl. Bras. VI 2 (1873—1876) 324; KOORDERS Exc. Fl. Java III (1912) 317; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1432; BACKER Handb. Suikerr. Java VII (1932) 758; *Eupatorium javanicum* BOERL.! Fl. Ned. Ind. II (1899) 175, 236.

Large shrub, branched, leafy; *stem* terete, ribbed, shortly densely crispy rusty or fulvously pubescent, 3½—9 mm thick; side-branches in the axils of the upper leaves; internodes 5—10 cm long. *Leaves* petiolate (petioles subalate, dilate at the base, shortly felty rusty greyish tomentose, ½—3 cm long), ovate-oblong, ovate-lanceolate, deltoid-oblong or rhomboid-oblong, extremely long and sharply acuminate at the top, gradually or suddenly attenuate, acute at the base, sharply or subobtusely sometimes coarsely serrate (of one specimen rarely entire), except the lower part, scabridly pubescent, dark coloured above, densely shortly greyish of fulvously pubescent beneath, membranous or subcoriaceous, pinni-nerved, nearly 3-nerved from the base (3—4 pairs of lateral nerves; reticulations obvious beneath, inconspicuous above); blades 7—16 cm long, 2½—7½ cm broad; upper ones lanceolate or linear, smaller, 1—9 cm long, ½—1½ cm broad. *Heads* crowded, in dense, large, luxurious terminal corymbs; side-branches of the inflorescence in the axils of small leaves; lower ones leafy at the inferior part, felty like the stem. *Heads* pedunculate (peduncles tomentose, 1—2 mm long), campanulate, about 14-flowers, 6 mm long, 4 mm wide. *Involucre* loosely campanulate, 3-seriate; scales gradually shorter to the exterior ones, whitish, shining (when dry), of the inner row lanceolate, obtuse and pubescent at the top, 3-nerved (nerves prominent), 5 mm long, 1 mm broad; of the outer rows ovate-oblong, convex, 3-nerved (nerves prominent), pubescent, obtuse, nearly rounded at the top. *Flowers* 5 mm long. *Corolla* infundibuliform, narrow, 5-lobed, tube and limb not to be separated; lobes deltoid, acute at the top, 3½ mm long. *Anthers* nearly rounded at the top, acute at the base. *Style*-branches very long, nearly as long as the corolla, obtuse at the top, ciliate. *Achene* oblong, 5-angular, glabrous, 1½ mm long. Setae of the *pappus* numerous, connate at the base by a ring, shorter than the corolla. *Receptacle* slightly convex, alveolate.

Distribution in the Malay Archipelago:

Sumatra: *East Coast*: Medan, experimental fields D. P. S.,

Jochems 3020 (B); *West Coast*: Fort de Kock, Yates 2478 (B); Sumatra: Tanang Taloe, Bünnemeyer 1061 (L).

Java: *West Java*: Tjibodas, Koorders 37128 (L), 31786 (B), 31851 (B), Lörzing 1489 (U), Raap 668 (L), Hallier 320 (B) — Tjiandjoer, Takoka, Koorders 15022 (L), 33318 (B) — north of Tjiandjoer, Backer 23552 (B), Zwaardemaker 53 (B) — near Tjiandjoer, G. Gede, Backer 3077 (B) — Tjidadap, Tjibeber, Tjiandjoer, Bakhuizen van den Brink 2981 (L), 15a (L), Winckel 764 (B) — Bandoeng, Tjinjiroean, coll. unknown (L, B) — Soekaboemi, Ridley s.n. (K), Backer 14539 (B) — id. Tjitjoeroeg, Backer 17264 (B) — Palaboeanratoe, Soekaboemi, Koorders 34647 (B) — Pasawahan, Soekaboemi, Backer 2222 (B) — south of Lampegan, Tjiandjoer, Backer 14819 (B) — Nanggarang, Soekapoera, Backer 9094 (B, K) — G. Goentoer, van Rijckevorsel s.n. (B), Koens 230 (B) — G. Gede, Tjibeureum, Backer 2344 (B), Hochreutiner 25 (G) — G. Patoeha, Backer 12635 (B) — G. Rakoetak, Bandoeng, Roelofsen 6250 (B) — G. Papandajan, Backer 5644 (B) — G. Malabar, Denker 11 (B) — Garoet, Burck s.n. (B), coll. unknown (B) — S.W. of Bandoeng, Lörzing 1127 (B) — Tankoeban Prahoe, van der Veen s.n. (L) — Radjamandala, Bandoeng, Backer 13469 (B) — near Leuwiliang, Buitenzorg, Bakhuizen van den Brink 6550 (L), Backer 25919 (B) — Buitenzorg, Soegandiredja 55 (K, B), Raap 74 (L), Hallier 162a, b (B), Backer 31922 (B), 31920 (B), 33513 (B), 5871 (B) — Tjikopo, Buitenzorg, Boerlage s.n. (L) — Geger Bintang, Buitenzorg, Boerlage s.n. (L), Burck s.n. (B), Sapiin s.n. (B) — near Buitenzorg, Telaga Warna, coll. unknown (B) — west of Buitenzorg, Nanggoeng, Backer 10506 (B) — Tjiorek, south of Batoetoelis, Buitenzorg, Backer 33518 (B) — Djasinga, Backer 10087 (B) — Plered, Krawang, Backer 13929 (B) — G. Gede, Kramer 110 (B) — id. Kandang Badak, Backer 13596 (B) — G. Salak, Koorders 33283 (B), 36702 (B), Backer 26419 (B) — G. Semboeng, Rongga, Bandoeng, Lörzing 1179 (B) — Bondjonglopang, S.W. of Soekaboemi, Backer 16935 (B) — Batavia, Backer 33516 (B), 33514 (B) — Meester Cornelis, Backer 33515 (B), 35517 (B) — G. Boerangrang near Wanajasa, Backer 14080 (B) — Nirmala, Batavia, Backer 10919 (B) — Noesa gede, in the lake of Pendjaloe, Tasikmalaja, Koorders 47995 (B) — Tjigoea, Priangan, Backer 15181 (B) — Depok, Burck and de Monchy s.n. (B) — Bodjongmanik, G. Liman, Lebak, Koorders 40931 (B) — between G. Kendeng and Malingping, Backer 1326 (B) — between Bajah and Langkop, Bantam, Backer 1701 (B) — Tjikaret Oelik, West Java, Raap 443 (L); *Middle Java*: G. Gadoeng, Keboemen, Boerlage s.n. (L); *East Java*: G. Kawi, Wisse

281 (B) — Nongkodjadjar, S.E. of Lawang, WISSE 548 (B) — G. Smeroe, BACKER 3551 (B).

Moluccas: *Amboina*, ROBINSON 1844 (L, K, B).

Flowers white (KOORDERS a.o.); odoriferous (BACKER a.o.); anthers violet and styles white (BACKER l.c.); shrub, sometimes nearly a tree, 1—5 m high, 8—10 cm thick (KOORDERS).

Vernacular names: *babandjaran, grinjoe, semboeng, krinjoe, darismin,* (*ki*) *oengkloek, kembang ocroek, kidajang* (all Java).

Hab.: in forests and jungles, along edges of ditches, on banks of rivers, in ravines, on slopes, along waysides, in grassy fields, tea-gardens, in an old coffee-garden, on a lava stream; very common, few to abundant; in sunny or not too shady and not too dry localities (ex BACKER l.c.).

Altitude: 5—1800 m.

Flowers during the whole year.

Use: the wood used as firing (ex HEYNE l.c.), the pappus-hairs for stuffing cushions (id.), the leaves for dunging, making good humus and gathering nitrogen (id.).

Distribution: trop. America: Brazil!, Argentine!, Paraguay!, Urugay!, Ecuador!.

In the Kew Herbarium specimens of this species, identified by ROBINSON and named *Eupatorium inulifolium* H. B. K. forma *suaveolens* (H. B. K.) HIERON. (Bolivia) are to be found; specimens with much more woolly tomentose leaves are named *Eupatorium inulifolium* H. B. K. by that author.

II. Sectio **Eximbricata** DC. Prod. V (1836) 164; HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 140.

Involucrum 1—3-seriate (acc. to HOFFM. 1—2 seriate), scales few, equal or imbricate. *Receptacle* flat.

(4) **Eupatorium nodiflorum** WALL.! Cat. (1828) 3166 comp. 276, DC. Prod. V (1836) 179; CLARKE Comp. Ind. (1876) 31; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 508; KOSTER in Fedde Repert. XXXIV (1933) 6.

Herb, about ½ m high; *stem* terete, ribbed, scabrid, more or less purplish, black-striped, 2 mm thick; internodes 5½—7½ cm long; side-branches in the axils of the upper leaves. *Leaves* subsessile or very shortly petiolate (petioles subalate, 0—2 mm long), elliptic-lanceolate or elliptic-ovate, acuminate and acute at the top, acute at the base, sharply serrate (lower teeth sometimes much longer and very acute), or subentire, densely glandular ,scabrid beneath, glandularly spotted, strigose above, coriaceous, edges recurved, 3-nerved (one pair of lateral nerves, nerves scabrous beneath); 3—4½ cm long, 7—12 mm broad; upper leaves alternate, smaller, linear, entire, to 2 cm long, 1½ mm broad. *Heads* in dense terminal corymbs; also small corymbs at the top of the side-branches; ramifications gradually shorter to the upper ones, scabridly greyish

hirsute, having minute bracts at the base and higher on; extreme ones trichotomous. Heads shortly pedunculate (peduncles scabridly hirsute, ½—2 mm long) oblong, 5-flowered, 6 mm long, 3 mm wide. *Involucre* oblong, 3-seriate; scales about 8, gradually shorter to the exterior ones, acuminate or mucronate, acute or subacute at the top, oblong or ovate-oblong, 3—5-nerved, glabrous, with shining glands, purplish at the upper part, having membranous edges, inner ones 5 mm long, 1 mm broad, outer ones minute, ciliate at the edges. *Flowers* 6 mm long. *Corolla* subinfundibuliform, 5-lobed, purplish, when dry, 3½ mm long; limb and tube hardly to be separated; lobes deltoid, broad, acute at the top, with shining glands. *Anthers* obtuse at the base, subacute at the top. *Style*-branches long, obtuse at the top, papillose. *Achene* oblong, ribbed (ribs prominent) 4- or 5-angular, glabrous, with shining glands, black; 1½—2½ mm long, ½ mm wide. *Pappus*-setae numerous, equal, about as long as the corolla, white, ciliate, connate at the base. *Receptacle* small, flat, alveolate.

Distribution in the Malay Archipelago:

Lombok: G. Rindjani, G. Poesoek, ELBERT 1753 (L).

Hab.: in jungles; on a fairly dry, clayish soil.

Altitude: 1450—1650 m.

Flowers: June.

The anthers of the specimen from Lombok are degenerated, the filaments are broadened and connate along the whole length; only the very upper part of the anthers is fertile.

Distribution: Trop. Asia: Bengal!, Assam! (Khasia!), Himalaya!, Annam!, Tonking, Siam, China, Philippines (Luzon!).

This species is difficult to be distinguished from *Eupatorium Reevesi* WALL.!, which has smaller heads and broader leaves and *Eupatorium cannabinum* L.!, which has pinni-nerved, membranous leaves; its outer involucral scales are rounded at the top. From *Eupatorium Toppingianum* ELMER it is to be dinstinguished by having acute involucral scales and 3-nerved leaves.

CLARKE (Comp. Ind., 1876, 30) records *Eupatorium odoratum* L. to be escaped in Java. In the herbaria examined no specimen from Java has been found.

(5) **Eupatorium Horsfieldii** MIQ.! Fl. Ind. Bat. II (1856) 27.

Herb; *branches* glabrous (extreme ones pubescent, ribbed), 2 mm thick; internodes 2—4 cm long. *Leaves* petiolate or subsessile (petioles 0—3 mm long), elliptic, gradually attenuate into the petiole, gradually attenuate and acute at the top, glabrous and glandular above, glabrous or subglabrous (very few short hairs on the nerves), glandular beneath, sharply serrate (some of the upper leaves subentire), submembranous, pinni-nerved (nerves prominent beneath, lateral ones about 5 pairs; extreme ones reticulate), edges recurved, blades 3—4½ cm long, 1—2 cm broad. Heads corymbosely paniculate; *inflorescence* terminal or in the

axils of the upper leaves; branches often having a very small bract (2 mm long) at the base. *Heads* pedunculate, oblong, 5-flowered, 6 mm long. *Involucre* subcampanulate, oblong, 2—3-seriate, inner scales linear-oblong, obtuse or subacute at the top, 6 mm long, outer ones much smaller, 1—3 mm long; all glabrous, herbaceous, 3-nerved, without glands. *Corolla* 5-lobed, 4½ mm long, without glands; limb narrowly campanulate, 2 mm long; lobes very short, deltoid, acute at the top. *Anthers* obtuse at both ends, broad. *Style*-branches short, glabrous. *Achene* oblong, 5-angular, ribbed (ribs prominent), pubescent, when young, sparsely pubescent, when ripened, glandular, 3½ mm long. *Pappus* white, 4 mm long; setae ciliate. *Receptacle* small, alveolate.

Distribution in the Malay Archipelago:

Java: herb. HORSFIELD 31 (K, Br. M.).

This species is much allied to *Eupatorium nodiflorum,* but it is to be distinguished by the large pubescent achenes. From *Eupatorium Toppingianum* it is different by the glabrous leaves. It has not been collected again after HORSFIELD.

(6) **Eupatorium Toppingianum** ELMER Leafl. Phil. Bot. I (1906) 101; MERRILL! Enum. Phil. III (1923) 597; *Eupatorium sambucifolium* ELMER! Leafl. Phil. Bot. I (1906) 102; *Eupatorium benguetense* C. B. ROBINSON! in Phil. Journ. Sci. III (1908) 217; MERRILL in Phil. Journ. Sci. V (1910) 393.

Shrub; *stem* terete, striate, rusty crispy pubescent or subglabrous, glandular, 1½—3 mm thick; internodes 1—3 cm long. *Leaves* petiolate (petioles pubescent like the stem, ½—1½ cm long), elliptic-oblong, long acuminate at the top, acute at the base, serrate (teeth directed forward) or subglabrous, glandular, very shortly pubescent or subglabrous on both sides, pinni-nerved (nerves prominent and rusty pubescent beneath; lateral ones about 7), paler beneath, edges recurved; blades 4—7½ cm long, 1½—2½ cm broad. *Corymbs* terminal, dense 6—9 cm wide. *Heads* pedunculate (peduncles thin, rusty pubescent, 2—5 mm long), numerous, 5-flowered, 6½ mm long, 3 mm thick. *Involucre* campanulate, 3-seriate; scales about 10, gradually shorter to the exterior ones, inner ones glabrous, oblong, obtuse at the top, 4½ mm long, 1—1½ mm broad, of the second row subacute at the top, pubescent, 1 mm long, less than 1 mm broad, of the exterior row minute. *Corolla* infundibuliform, 5-lobed, 4 mm long; lobes deltoid, subacute at the top; limb as long as the tube. *Anthers* obtuse at both ends. *Style*-branches gradually broader to the top, subacute at the top, long exserting the corolla. *Achene* narrowly oblong, 5-angular, subglabrous, 2½ mm long. *Pappus* 3 mm long, consisting of many ebony-coloured hairs. *Receptacle* minute.

Distribution in the Malay Archipelago:

Moluccas: Central *Ceram*, Hatoe Sosokoetai, Walokone, RUTTEN 2212 (L, B), id., G. Pinaia, STRESEMANN 293 (L); N.W. *Boeroe*, G. Fogha, STRESEMANN 375 (L).

Flowers white (RUTTEN, STRESEMANN); shrub 2 m high (RUTTEN).
Hab.: in a primeval forest, in mountain meadows; fairly common.
Altitude: 1000—3000 m.
Flowers: Febr., May, Aug.
Distribution: Philippines (Luzon!, Negros!).

(7) **Eupatorium riparium** REGEL Gartenflora XV (1866) 324 t. 525; STANDLEY in Contr. U.S. Nat. Herb. XXIII (1926) 1464; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1432; *Eupatorium Harrisii* URBAN! (ex STANDLEY l.c.) Symb. Antill. I (1900) 460.

Shrub or herb, much branched, 60—80 cm high, *stem* creeping at the base, having roots at the lower nodes, terete, glabrous and lenticellate on the lower part, shortly pubescent and warty on the superior part, 1½—3 mm thick, internodes 3½—6 cm long; short leafy branches in the axils of the leaves. *Leaves* petiolate (petioles broadened at the base, 1—2 cm long), small, narrowly elliptic-lanceolate to elliptic, attenuate and acute at both ends, sharply serrate at the upper part, entire at the smaller lower part, edges recurved, 3-nerved at the base (nerves prominent beneath, diverging a little near the base, lateral ones small, about 3 pairs, extreme ones reticulate), glabrous at both sides or subglabrous beneath, membranous or chartaceous; blades 2—10 cm long, ½—2½ cm broad; upper ones slightly smaller. *Corymbs* rather smaller, paniculate, terminal and at the top of the side-branches in the axils of the upper leaves, consisting of 12—25 heads; branches subtrichotomous, slender, having very small leaves at the base. *Heads* pedunculate (peduncles very slender, filiform, 6—7 mm long, having a minute linear bract at the base and 2 more higher on), about 20-flowered, 6 mm long, 4—5 mm wide, having a linear bracteole at the base. *Involucre* campanulate, 1—2-seriate. spreading; scales equal, linear, about 12, subobtuse and ciliate at the top, 2-nerved (nerves prominent), shortly pubescent, 4 mm long, 1 mm broad. *Corolla* 5-lobed, 3 mm long; limb campanulate, clearly to be distinguished from the narrow tube, slightly pubescent at the top; lobes deltoid, acute at the top, subconvex. *Anthers* very shortly sagittate at the base, obtuse at the top. *Style*-branches ciliate at the upper part, subobtuse at the top. *Achene* linear-oblong, 5-ribbed (ribs pubescent) suddenly narrowed close to the top, black, 1½—2 mm long. *Pappus* as long as the corolla; setae ciliate, few minute ones mixed among the other ones. *Receptacle* small, nearly flat, alveolate.

Distribution in the Malay Archipelago:

Java: *West Java*: Tjibodas, LÖRZING 1931 (L), BACKER 26051 (L), 32420 (B), 13517 (B), KOORDERS 31727 (B), 42195 (B), BRUGGEMAN 270 (B), VAN STEENIS 1810 (B), SAPIIN s.n. (L, B), 2828 (K), VALETON s.n. (L, B), LAM 310 J (B) — between Sindanglaja and Tjibodas, BACKER 21534 (B), ERNST s.n. (B) — near Tjibodas, BACKER 31335 (B) — Sindanglaja, KOORDERS 42052 (L, K) — Tjibeureum near Bandoeng, DEN BERGER 629 (B) — Tjipanas, KAWAKAMI s.n. (B) — Tjisaroea, Buitenzorg, DOCTERS VAN LEEUWEN 8085 (L) — G. Pangerango, VAN SLOOTEN 27 (B), VAN STEENIS 5177 (B) — id. near Kandang, Badak, DOCTERS VAN LEEUWEN 4278 (B) — Tjikopo, Buitenzorg, LAM 3783 (B) — N.W. of the G. Poentjak near Buitenzorg, BACKER 23995 (B).

Flowers white (BACKER a.o.); pappus red (VAN STEENIS); plant more or less reddish (LAM), 40 cm (BRUGGEMAN), up to 3 m high (VAN STEENIS), climbing or procumbent (VAN STEENIS).

Vernacular names: *babanjaran, djotang lalakina* (all Java).

Hab: in primeval forests, along waysides, edges of ravines and brooks, in tea gardens; in wet localities; usually abundant, very common, locally dominating; often in steep localities Flowering only in sunny localities (LAM).

Altitude: 1000—2400 m.

Flowers: April—Dec.

Used for medical purpose (KOORDERS).

Distribution: Mexico and the West Indies (Jamaica!).

Regarding the shortly sagittate anthers and the pappus, having some minute setae mixed with the other ones, this species is intermediate between *Vernonia* and *Eupatorium*.

(8) **Eupatorium adenophorum** SPRENG. Syst. III (1826) 420; *Eupatorium glandulosum* H. B. K. Nov. Gen. et Sp. IV (1820) 122.

Tall herb, branched; *stem* subterete, densely covered with stalked glands, 2—3½ mm thick; internodes 1—7 cm long. *Leaves* petiolate (petioles 1½—3½ cm long, glandular like the stem, slender) broadly elliptic or rhomboid-elliptic, acute at both ends, acuminate at the top, mucronately angularly dentate, entire at the basal part, glabrous at both sides, paler beneath, pinni-nerved (4 pairs of lateral nerves, nerves glandular beneath; extreme ones obscurely reticulate), chartaceous; blades 6—9 cm long, 3½—6½ cm broad; upper leaves smaller. *Corymbs* small, terminal and at the top of the upper branches; ramifications of the inflorescence glandular like the stem, having small linear bracts at the base. *Heads* pedunculate (peduncles slender 2—5 mm long, glandular, having one or 2 linear bracts), campanulate, small, many-flowered, 5 mm long, 6 mm wide. *Involucre* campanulate, 3-seriate; scales about 20, gradually shorter to the exterior ones, lanceolate-elliptic, acute at the top,

with stalked glands along the margins, 3-nerved, inner ones 4 mm long, outer ones 1½ mm long. *Flowers* exceeding the involucre. *Corolla* 2½ mm long, tubularly infundibuliform, 5-lobed (lobes short, deltoid), glabrous. *Anthers* obtuse at both ends. *Style*-branches shortly exceeding the corolla, obtuse at the top, rather thick. *Achene* (immature) linear-oblong, slightly curved, 1 mm long, 5-angular, glabrous. *Pappus* dirty whitish, nearly as long as the pappus, setae about 10, ciliate. *Receptacle* flat, alveolate.

Distribution in the Malay Archipelago:

Java: *West Java*: Kertamana, Priangan, SPRUIT s.n. (B), det. B. L. ROBINSON — Tjinjiroean, Priangan, VAN SLOOTEN 739 (B) — Pengalengan, Malabar, coll. unknown V E (B).

Vernacular name: *bocgang boeroeng* (Soend.).

Hab.: in a grassy field; some specimens together.

Altitude: 1400—1450 m.

Flowers: Sept., Nov., Dec.

Distribution: Mexico!, West Indies, Bermudas, Canaries, Madeira!, Hawaian Islands, New Zealand.

This *Eupatorium* species is certainly introduced into Java.

BURMAN (Fl. Ind., 1768, 177) mentions *Eupatorium Dalea* L. from Java; he describes its leaves as lanceolate, inconspicuously serrate and glabrous, its heads as 4-flowered. DC. (Prod. V, 1836, 140) states, that this species only in Jamaica has been collected with certainty. MIQUEL (Fl. Ind. Bat. II, 1856, 27) suggested, that the concerning plant from Java might be *Eupatorium Horsfieldii*.

11. MIKANIA.

MIKANIA WILLD. Sp. Pl. III (1804) 1742; BL. Bijdr. (1825) 904; LESS. Syn. Comp. (1832) 157; MIQ. Fl. Ind. Bat. II (1856) 27; BENTH. et HOOK. Gen. Pl. II (1873—1876) 246; CLARKE Comp. Ind. (1876) iii; OLIVER Fl. trop. Afr. III (1877) 301; HOOK. Fl. Br. Ind. III (1882) 244; BAILLON Hist. Pl. VIII (1886) 128 (sub *Eupatorium*); HOFFM. in ENGL.-PRANTL Nat. Pfl. IV 5 (1894) 140; BOERL. Fl. Ned. Ind. II (1899) 176; KING et GAMBLE in Journ. As. Soc. Beng. LXXIV (1905) 30; ELMER Leafl. Bot. I (1906) 103; KOORDERS Exc. Fl. Java III (1912) 318; RIDLEY Fl. Mal. Penins. II (1923) 181; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 504; LEMÉE Dict. Genr. IV (1932) 477.

Scandent herbs or shrubs. *Leaves* petiolate. *Heads* spicate, racemose, corymbose or paniculate, small, 4-flowered. *Involucre* oblong, 2-seriate, consisting of 4 subequal scales, sometimes with one or more small outer ones. Limb of the *corolla* campanulate, 5-fid, tube narrow. *Anthers* appendiculate at the top. *Style*-branches slender, long, pubescent, subobtuse at the top, long exserting the corolla. *Achene* oblong, angular,

truncate at the top. *Pappus* setaceous, uniseriate; setae numerous, scabrous.

About 250 species chiefly in trop. America; also in Africa and Asia.

(1) **Mikania cordata** (BURM.) B. L. ROBINSON in Contr. Gray Herb. CIV (1934) 65; *Eupatorium cordatum* BURM. Fl. Ind. (1768) 176 t. 58 fig. 2; *Eupatorium scandens* BURM. Fl. Ind. (1768) 176 (p.p.) non L.; *Eupatorium volubile* VAHL Symb. III (1794) 93; *Mikania volubilis* WILLD. Sp. Pl. III (1804) 1743; BL.! Bijdr. (1825) 904; DC. Prod. V (1836) 199; ZOLL.! in Nat. Gen. Arch. Neêrl. Ind. II (1845) 229; SCH.-BIP.! in ZOLL. Syst. Verz. Ind. Arch. (1854) 120; MIQ.! Pl. Jungh. (1854) 497; MIQ.! Fl. Ind. Bat. II (1856) 28; MIQ. Sumatra (1862) 210; MATTFELD! in Engl. Bot. Jahrb. XLII (1929) 405; KOSTER in Fedde Repert. XXXIV (1933) 7; *Mikania scandens* CLARKE Comp. Ind. (1876) 35; KURZ in Journ. As. Soc. Beng. XLVI (1877) 197; HOOK. Fl. Br. Ind. III (1882) 244; FORBES et HEMSLEY in Journ. Linn. Soc. Bot. XXIII (1886—1888) 405; BOERL.! Fl. Ned. Ind. II (1899) 176, 236; KING et GAMBLE in Journ. As. Soc. Beng. LXXII 2 (1905) 30; ELMER Leafl. Phil. Bot. I (1906) 104; MATSUMURA et HAYATA in Journ. Sci. Tokyo XXII (1906) 203; LAUTERBACH in Nova Guinea VIII 4 (1912) 863; KOORDERS Exc. Fl. Java III (1912) 318; GIBBS in Journ. Linn. Soc. Bot. XLII (1914) 97; MERRILL Journ. R. As. Soc. (1921) 587; RIDLEY Fl. Mal. Penins. III (1923) 181; MERRILL Enum. Phil. III (1923) 598; GAGNEP. in LEC. Fl. Indo-Chine III (1924) 504; RENDLE in Journ. Bot. LXIII (1925) suppl. 54; HEYNE Nutt. Pl. Ned. Ind. II (1927) 1433; ALSTON suppl. Fl. Ceylon VI (1931) 160; BACKER Handb. Suikerr. Java VII (1932) 759; HOCHREUTINER in Candollea V (1931—1934) 300, non WILLD.

Scandent herb. *Stem* subterete or irregularly angular, ribbed, slightly pubescent (densely pubescent on the nodes) or subglabrous, 2—3 mm thick; internodes 6—14 cm long, nodes thickened. *Leaves* petiolate (petioles long, slender, pubescent or glabrous, 1—6 cm long, hardly 1 mm or 1 mm broad), deltoid-ovate, cordate-ovate, acuminate and acute at tip, cordate or shortly acute at the base (if cordate, auricles rounded or subacute), entire or more or less coarsely crenate or undulate, slightly mucronulate, warty, subglabrous or slightly pubescent at both sides, glandularly spotted beneath, submembranous, 5-nerved from the base (extreme nerves reticulate; blades 3—10 cm long, 1½—6 cm broad, higher ones smaller, 1—3½ cm long, 7—25 mm broad, subentire; petioles 1—2 cm long. *Heads* in compound corymbs at the top of short side-branches and in the axils of the leaves; corymbs on peduncles of different length, consisting of many heads; branches sparingly pubescent or subglabrous, ½ mm thick, with or without a small linear leaf. Heads

pedunculate or subsessile (peduncles slender, slightly pubescent, ½—6 mm long, having a linear bract at the base or at the top; bract pubescent, acute et tip, 2—5 mm long), 4-flowered, cylindric, 6—9 mm long, 1½—2 mm thick. *Involucre* consisting of 4 scales; scales oblong, acute or obtuse and mucronate or nearly rounded at the top, slightly attenuate and swollen at the base, convex, glabrous or slightly pubescent, 3-nerved (nerves prominent), edges membranous, 5—7 mm long, 1 mm broad. *Corolla* minutely glandular, 4—5 mm long, limb campanulate, 5—6-lobed, 1½ mm long, lobes long, acute at the top, tube slender, nearly filiform, 2½ mm long, apart from the limb, slightly appressed, pubescent. *Anthers* obtuse at the base, subobtuse at the top. *Style*-branches long, subobtuse at the top, papillous at the upper part, grooved at the lower part, 2½ mm long, nearly half as long as the style. *Achene* linear-oblong, 4-angular (ribs prominent), glabrous, glandular, 2½—3 mm long, ½ mm thick. *Pappus* uniseriate, setaceous, 3—4 mm long; setae numerous, salmon-coloured or whitish, ciliate. *Receptacle* minute (cf. notes on p. 509—510).

Distribution: Br. India, Mal. Penins., Indo-China, Philippines, Mal. Arch., New Guinea, trop. Africa.

Use: Natives use the leaves to cure wounds (Hallier).

1. forma **typica**; *Eupatorium cordatum* Burm. Fl. Ind. (1768) 176 t. 58 fig. 2.

Leaves quite entire, cordate-ovate or cordate; auricles of the leaves rounded.

Distribution in the Malay Archipelago:

J a v a: *West Java*: Tjiomas, near Buitenzorg, coll. unkn. (B) — G. Batoe, Priangan, Raap 560 (L).

B o r n e o: *Br. N. Borneo*: Melalap, Gibbs 2739 (K) — Khota Baloed, Kibayo, Clemens 9774 (K); *Sarawak*: Baram district, Hose 279 (K), 170 (K) — N. Borneo, Burbidge s.n. (K).

C e l e b e s: *Manado*, between Soekoer and Soewaan, de la Savinierre 285 (K).

M o l u c c a s: *Ceram*: Ninama, between Pasahari and Kaloai, Kornassi 744 (L) — Kaniki, Kornassi 553 (L) — between Kaniki and Manoesela, Kornassi 1405 (L) — near Maneo, Rutten 310 (L) — near Melilia, Rutten 1642 (L) — between Kabailoe and Kabohari, Rutten 237 (B).

Flowers white (Backer a.o.), dirty greyish white (Lörzing), dirty yellow or green and white (Lörzing), odoriferous (Koorders a.o.), anthers purplish brown, style white (Lam). Lianas to 5 m long (Lörzing, Koorders). Leaves pale green (Bünnemeyer, van Steenis). Branches winding to the left as well as to the right in the same plant (Backer).

Vernacular names: *brodjo lego, semboeng rambat, sientrong, areng lètah hajam, djapoet toehur, tjlerem* (*sapi*), *ki oki, tradjon, sobowingi, areuj tjapitoeheur* (all Java), *hila hitoe lama* (Ambon), *babaleh telokkoh, lamba, blajang, tambara assoe* (all Celebes), *baimenjangsang, sipitoengoe, sape toengoes, sapitantoengoe(r), bloekar* (all Sumatra), *hoela* (Tidore), *orang arung, brodjo wengi, tempoejoeng klerem, plopor polo, ojot poeti, aroi bodas.*

The leaves of the specimens from Ceram are often not cordate at the base, but truncate. BURMAN described the branches as quite glabrous, which certainly is not the case in all the specimens cited.

Hab.: in primeval forests.

Altitude: 0—20 m.

Flowers: June, Sept.—Dec.

Distribution: New Guinea!, VON RÖMER 578 (L).

2. forma **undulata** nov. f.

Folia crenata vel undulata, paulo mucronulata.

Distribution in the Malay Archipelago:

S u m a t r a: *East Coast*: Sibolangit near Medan, NATIVE COLL. 7218 (K), LÖRZING 3891 (B) — plain of Upper Bila, Sibolangit, LÖRZING 9621 (B) — Boekit Kloeang-valley, coll. unknown 7217 (B) — near G. Batoe Manoempak, LÖRZING 7969 (B) — Perbaoengan, Serdang, LÖRZING 3261 (B); East Coast, YATES 972 (B); *West Coast*: LKoto, Bt. Tinggi, BÜNNEMEYER 3025 (L) — id., S. A. Ramboetan, BÜNNEMEYER 3406 (L) — Barong baroe, Tapan, Korintji, ROBINSON and KLOSS s.n. (K) — Seolak dras, Korintji, ROBINSON and KLOSS s.n. (K) — Kp. Baroe, Korintji, BÜNNEMEYER 8085 (B) — G. Talamau, BÜNNEMEYER 433 (B) — Padang, coll. unknown 211 (B) — Anei-cleft, KLEINHOONTE 596 (B); *Bengkoelen*: Soeban Ajam, JACOBSON 331 (B) — Benkoelen, town, JACOBSON 23 (L); *Lampongs*: estate Wai Lima, IBOET 371 (L); Middle Sumatra, KOORDERS 21375 (B); Sumatra, KORTHALS s.n. (L).

B a n g k a: near Langgan, coll. unknown (B).

K r a k a t a u I s l a n d s: Verlaten Island, BACKER s.n. (B).

J a v a: *West Java*: swamp of Danoe, Serang, KOORDERS 40579 (L), type specimen, 40563 (B) — Bantam, FORBES 426 (B) — Rangkasbitoeng, BACKER 1003 (B) — between Tjitorek and Moentjang, Lebak, BACKER 1813 (B) — G. Kentjana, BACKER 1241 (B) — Depok, KOORDERS 31145 (L), 44163 (B), BEUMÉE 6772 (B), BACKER 31787 (B) — G. Karang near Gloesoer, Bantam, KOORDERS 40667 (B) — Tjadasmalang near Tjibeber, Tjiandjoer, WINCKEL 1400 (L) — Tjidadap, Tjibeber, Tjiandjoer, BAKHUIZEN VAN DEN BRINK 2996 (L) — south of Tjibeber, Tjiandjoer, BACKER 22717 (B), BAKHUIZEN VAN DEN BRINK 2443 (B), 747 (B) — Tasikmalaja, KOORDERS 43342 (L) — G. Galoenggoeng, near Singaparna, BACKER 8571 (L, B) — G. Salak, KURZ 497 (K), RAAP 603 (L), 175 (L), BACKER

9225 (B) — Wanajasa, G. Boerangrang, BAKHUIZEN VAN DEN BRINK 4725 (L), 4705 (B) — Tjisaroea, Tjibodas, RAAP 8 (L) — Tjibodas, BOERLAGE s.n. (L), HALLIER 612 (B), KOORDERS 31616 (L) — Garoet, BURCK 96 (B) — Priangan, PLOEM s.n. (L) — Buitenzorg, BAKHUIZEN VAN DEN BRINK 1918 (L), 7451 (L), BACKER 25853 (B), SCHEFFER s.n. (B) — Geger Bintang, near Buitenzorg, ARSIN 19597 (B) — Tjisalak, Buitenzorg, ARSIN 19473 (B) — Batavia, BLUME s.n. (L) — east of Tandjoeng Priok, VORDERMAN s.n. (B) — Poerwakarta, BACKER 13898 (B) — near Warongloa, Buitenzorg, VAN SLOOTEN 695 (B) — Bandoeng, VALETON s.n. (B), coll. unknown (B) — G. Tiloe, Priangan, SCHEFFER s.n. (B) — G. Patoek, Priangan, BAKHUIZEN VAN DEN BRINK 499 (B) — G. Kendang, Priangan, KOENS 207 (B) — G. Papandajan, BACKER 5645 (B) — Kartamana near Pengalengan, south of Bandoeng, SMITH and RANT 517 (B) — G. Telegabodas, BURCK 123 (B), BACKER 3186 (B) — Tjipanas, BAKHUIZEN VAN DEN BRINK 531 (B) — Lembang, VAN WELSEM 6 (B) — G. Malabar, DENKER 106 (B) — Indihiang, Soekapoera, BACKER 8538 (B) — Segalaherang, Krawang, BACKER 14233 (B) — G. Goentoer, DANSER 6776 (B) — G. Tjeremai, BACKER 4843 (B); *Middle Java*: Soebah, Batang, KOORDERS 36897 (L), ADMIN. RUBBER PLANTATION s.n. (B) — near Doro, Pekalongan, BACKER 15601 (B), 15760 (B), DOCTERS VAN LEEUWEN 501 (B) — Petoeng kriono, Pekalongan, BACKER 15766 (B) — near Tjandiroto, Kedoe, LÖRZING 628 (B) — Pekalongan, SMITH s.n. (B) — Kali Poetjang, Kedoe, BACKER 4394 (B) — G. Merapi, JUNGHUHN 328 (L) — Banjoebiroe, Semarang, KOORDERS 36223 (L) — Salatiga, DOCTERS VAN LEEUWEN 71151 (L); *East Java*: West Toeban, Rembang, BEUMÉE 1107 (B) — Pajaman, Padangan, BEUMÉE 874 (B) — G. Pandan, THORENAAR 173 (B) — G. Kawi, WISSE 267 (B) — near Manggis, Kediri, KOORDERS 22920 (B) — Ngebel, G. Wilis, KOORDERS 23224 (L), 23202 (B), 29186 (B) — Soembersangkil, Bangil, KOORDERS 23583 (L) — Wonokerto, south of Bangil, BACKER 3476 (B) — G. Ardjoeno, Tretes, BREMEKAMP s.n. (B) — Malang, VAN OOSTEN 7 (B), KOORDERS 23470 (B) — south of Bantoer, Malang, BACKER 3982 (B) — Blarong near Lawang, MOUSSET 399 (B) — G. Tengger, near Nongkodjadjar, BUIJSMAN 106 (L) — id., near Poespo, KOBUS s.n. (B) — Djatiroto, BACKER 7842 (B) — Tjoeramanis, Djember, KOORDERS 37775 (L), 20559 (B) — G. Idjen, BACKER 25386 (B), 24899 (B), VAN SLOOTEN 2480 (B) — Rahoen-Idjen, Sitoebondo, KOORDERS 19925 (B); Java, near Kapang doengan, KUHL and VAN HASSELT s.n. (L); Java, REINWARDT s.n. (L), HORSFIELD 10 (K), det. MIQ. (U), WAITZ s.n. (L), BLUME s.n. (L), ZOLLINGER 417 (L), KORTHALS s.n. (L).

Noesa Kembangan, south of Java: Tjimiring, AMDJAH 217

(B) — Noesa Kembangan, NATIVE COLL. 306 (L), KOORDERS 22059 (B).

Lombok: Rindjani, valley of Sapit, south slope of G. Poessoek, ELBERT 1843 (L), 1907 (L).

Soembawa: Bima, Kenanta, Donggo, ELBERT 3567 (L) — id. Oo, Donggo, ELBERT 3499 (L) — Batoe Doelong, RENSCH 621 (B).

Borneo: *Br. N. Borneo*: K. Kinabaloe, Dallas, CLEMENS 27318 (B, K); *Sarawak*: Sarawak river, HAVILAND s.n. (K) — Sarawak, BECCARI 459 (K); *S.E. Borneo*: Banjermasin, MOTLEY 309 (K) — Pembliangan, AMDJAH 900 (L); *W. Borneo*: S. Kapoeas, TEYSMANN 8302 (B) — S. Landak, TEYSMANN 21298 (B) — Soekal Santing, Pontianak, HALLIER 109 (B); Borneo, JAHERI s.n. (B), HAVILAND and HOSE s.n. (L).

Celebes: *Manado*: Tondano, FORSTEN s.n. (L), KRUYFF 21 (B) — Minahassa, near Rasahan, LAM 2409 (B) — Manado, KOORDERS 16478 (L), 16480 (L), 16481 (L); *S.W. Celebes*: Bonthain, TEYSMANN 13693 (B), 14082 (B), 14127 (B) — Lombasang, BÜNNEMEYER 11809 (L), 11037 (L), 11705 (L, K) — Pangkadjene, TEYSMANN 11922 (B), 12107 (B); Celebes: Wawotobi, KJELLBERG 866 (B) — Rante Remo, KJELLBERG 1559 (B); P. Boeton S.E. of Celebes, Bau-Bau, ELBERT 6258 (L).

Saleier: DOCTERS VAN LEEUWEN 1771 (U).

Moluccas: *Amboina*, ROBINSON 1838 (L, K), TREUB s.n. (B), BINNENDIJK s.n. (B), coll. unknown 372 (B); *Boeroe*: Nal Besi, TOXOPEUS 196 (L); *Ternate*: Moja, BEGUIN 1015 (B) — Toramadiahi, BEGUIN 1111 (B) — *Halmahera*, Tidore, Boekoe Mala Mala, LAM 3754 (B).

Hab.: in Casuarina and other forests, in jungles, along waysides, on bank of rivers (acc. to BACKER l.c.) and brooks, along the edges of a dry rice field, in hedges of villages, along edges of ravines (acc. to BACKER l.c.), on a dry or a wet soil; on clay and on limestone; in sunny or not too shady localities (acc. to BACKER l.c.); one or numerous specimens together, scattered; common.

Altitude: 0—1900 m.

Flowers during the whole year.

Distribution: Bengal!, Assam, Burma!, Siam!, Penins.!, Penang!, Tonking, Annam, Laos, Cochinchina!, Formosa, Philippines (Luzon!, Mindanao!, Mindoro!, Leyte!, Palawan!, Negros!, Culion!), New Guinea!, Bismarck Arch., trop. Africa (acc. to ROBINSON l.c.).

3. forma **dentata** nov. f.

Folia angulato-cordata vel hastato-cordata, dentibus paucis, plus minusve deltoideis, acutis, mucronatis, apice decrescentibus, demum evanescentibus, inferioribus magnis, ad 7 mm longis.

Distribution in the Malay Archipelago:

Sumatra: *West Coast*: G. Talang, BÜNNEMEYER 5331 (L) — G. Singgalang, BÜNNEMEYER 2979 (L).

Java: *West Java*: G. Malabar, SOEGANDIREDJA 307 (L), 206 (B) —

G. Boekittoengoel, DE MONCHY 74 (B) — G. Geberbintang, near Buitenzorg, KOORDERS 26024 (L); *Middle Java*: G. Telemojo, KOORDERS 27691 (L), 35919 (B); *East Java*: G. Idjen, BACKER 25116 (L, B) — Pantjoer Idjen, Sitoebondo, KOORDERS 32262 (B) — Gendingwaloe, Probolinggo, KOORDERS 43342 (L) — G. Baloeran, along the edges of the crater, CLASON-LAARMAN F. 114 (B) — Sawahan, Kediri, GRUTTERINK 3103 (B).

Bali: G. Kelatakan, exped. MAIER 86 (L).

Borneo: *S.E. Borneo*: Doessoen, KORTHALS s.n. (L) — P. Lanssei, KORTHALS s.n. (L).

Celebes: *Manado*: Goeroepahi, KAUDERN 27 (L), type specimen — Minahassa, KOORDERS 16476 (L), 16479 (L); *S.W. Celebes*: G. Bonthain, BÜNNEMEYER 11603 (L), 11252 (L), 12121 (B), 12005 (B); Celebes, Pasaëran, exped. VAN VUUREN 292 (L).

Hab.: in forests, in a river bed; in not too shady localities.

Altitude: 500—2200 m.

Flowers: March—July, Sept., Oct., Dec.

4. forma **villosa** nov. f.

Folia utrinque, petioli et rami extremi dense ferrugineo-villoso-pubescentes, pilis incurvatis, articulatis.

Distribution in the Malay Archipelago:

Sumatra: *West Coast*: G. Sago, BÜNNEMEYER 3702 (L), type specimen — G. Talamau, BÜNNEMEYER 308 (B) — G. Merapi, BÜNNEMEYER 4820 (B); *Palembang*, north of the Ranau lake, VAN STEENIS 334 (B), 3747 (B); *Lampongs*: east of Tandjoeng Karang, AGRICULT. S. SUM. a (B) — G. Rate, Berenong, IBOET 261 (B), 263 (B); Sumatra, FORBES 2680 a (L).

Java: *West Java*: Depok, HALLIER s.n. (B), BURCK and DE MONCHY s.n. (B) — Pagindangan, BAKHUIZEN VAN DEN BRINK 45 E. (L); *East Java*: Djember, ULTÉE 26 (B).

Hab.: along the edges of forests, waysides, edges of a dry rice field in a young rubber plantation; on a moist soil, on clay.

Altitude: 50—1080 m.

Flowers: April—Dec.

Distribution: Philippines (Mindanao!), New Guinea!.

In Sumatra one specimen has been collected (IBOET 263) of this form with extremely small leaves (1—1½ cm long, 1—2 cm broad) and inflorescences existing of very few heads.

BLUME l.c. and MIQUEL l.c. noticed already a densely pubescent variety without naming it.

This only Asiatic *Mikania* species has been considered during a long time to be conspecific with its allies in North and South America. Since ROBINSON (in Contr. Gray Herb. LXIV, 1922, 24 and CIV, 1934, 65) has pointed out, that the Old World species is not conspecific with the North American *Mikania scandens*

(L.) WILLD., nor with the South American *Mikania micrantha* H. B. K., it seems reasonable to use BURMAN's name for the Asiatic *Mikania*. Indeed the three species of *Mikania* are distinct. The heads of *Mikania micrantha* are 4—5 mm long, they have a very small ovate bract at the base, the involucral scales are oblong-elliptic and shortly acute at the top, the limb of the corolla is broadly infundibuliform, the achene is less than 2 mm long. In *Mikania scandens* (L.) WILLD.! and *Mikania cordata* the heads are larger, 5—6 mm long (in *Mikania cordata* even up to 9 mm long), the bracts at the base of the heads are lanceolate and about half as long as the involucre in both species. The involucral scales in *Mikania scandens* are lanceolate-oblong, long acuminate and very acute at the top. The involucral scales are elliptic-oblong, shortly acute and mucronate at the top in *Mikania cordata*. The achenes in both species are longer than 2 mm, the limb of the corolla is campanulate. Moreover the colour of the corolla is white in *Mikania micrantha*, dirty white or white in *Mikania cordata* and purple (acc. to ROBINSON) in *Mikania scandens*. So *Mikania cordata* appears to be an originally Asiatic species.

HUMBERT (Comp. Madagasc., 1923, 33) does not separate *Mikania cordata* from *Mikania scandens*. He describes the corolla as white in the *Mikania*, occurring in Madagascar, so it may belong to *Mikania cordata*.

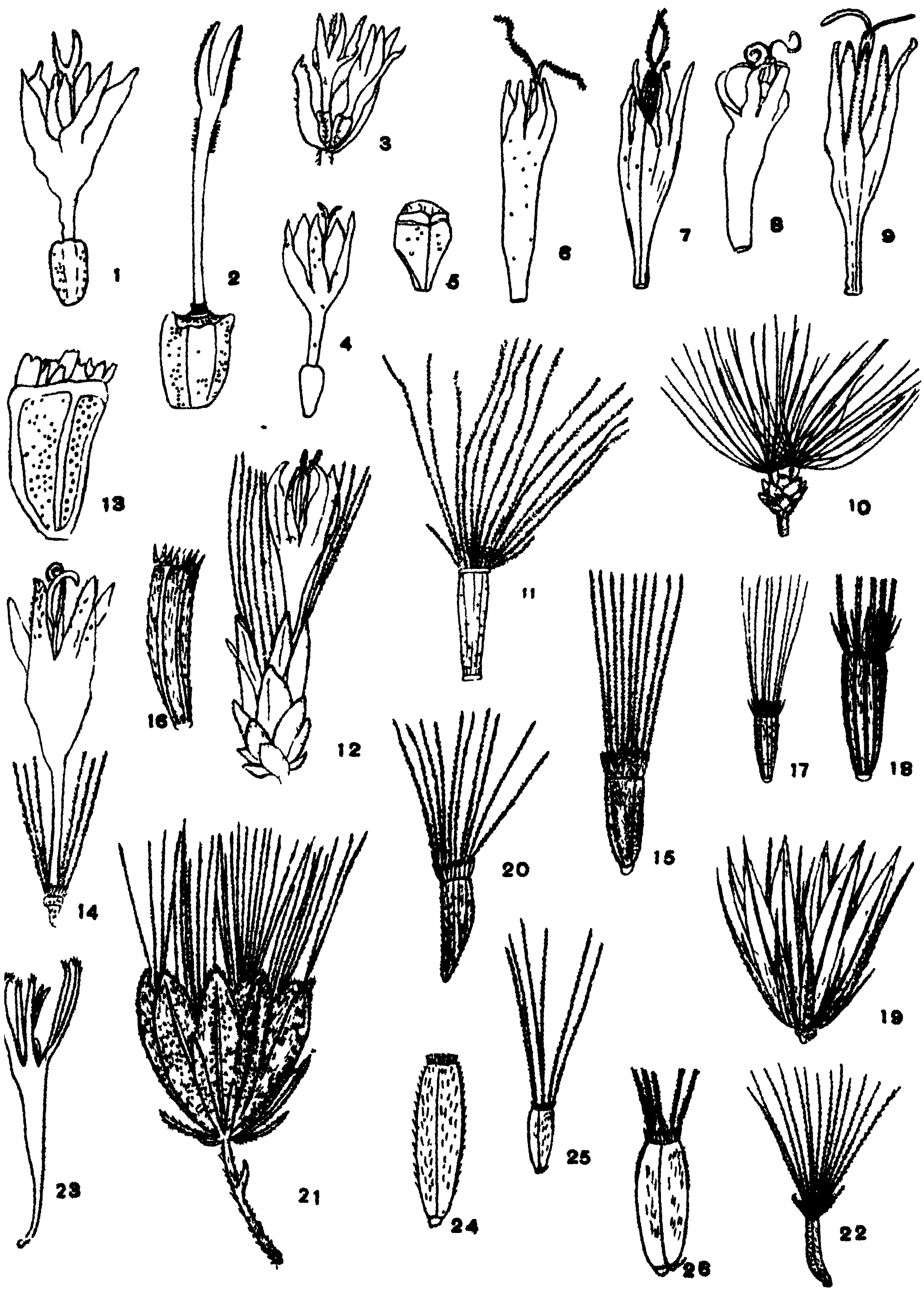
Pl. II.

1—2 *Ethulia megacephala* SCH.-BIP.: 1 flower; 2 achene with style; 3—5 *E. triflora* nov. spec.: 3 head, 4 flower, 5 achene; 6 *Vernonia arborea* HAM. var. *typica*: corolla; 7 *V. arborea* HAM. var. *javanica* (BL.) CLARKE: corolla; 8 *V. fimbrillata* nov. spec.: corolla; 9—10 *V. durifolia* nov. spec.: 9 corolla, 10 involucre, achene with pappus; 11—12 *V. kabaensis* KOSTER: 11 achene with pappus, 12 head; 13—14 *V. albifolia* KOSTER: 13 achene with outer row of the pappus, 14 flower; 15 *V. Junghuhniana* KOSTER: achene with pappus; 16 *V subtilis* nov. spec.: achene with outer row of the pappus; 17—19 *V. laxiflora* LESS.: 17 achene with pappus, 18 achene with outer row of the pappus, 19 involucre; 20 *V. Tengwallii* nov. spec.: achene with pappus; 21 *V. coerulea* nov. spec.: head; 22 *V. Reinwardtiana* DE VRIESE et MIQ.: achene with pappus; 23—24 *V. cymosa* BL.: 23 corolla, 24 achene with outer row of the pappus; 25—26 *V. erigeroides* DC.: 25 achene with pappus (only few setae of the inner row left), 26 achene with outer row of the pappus.

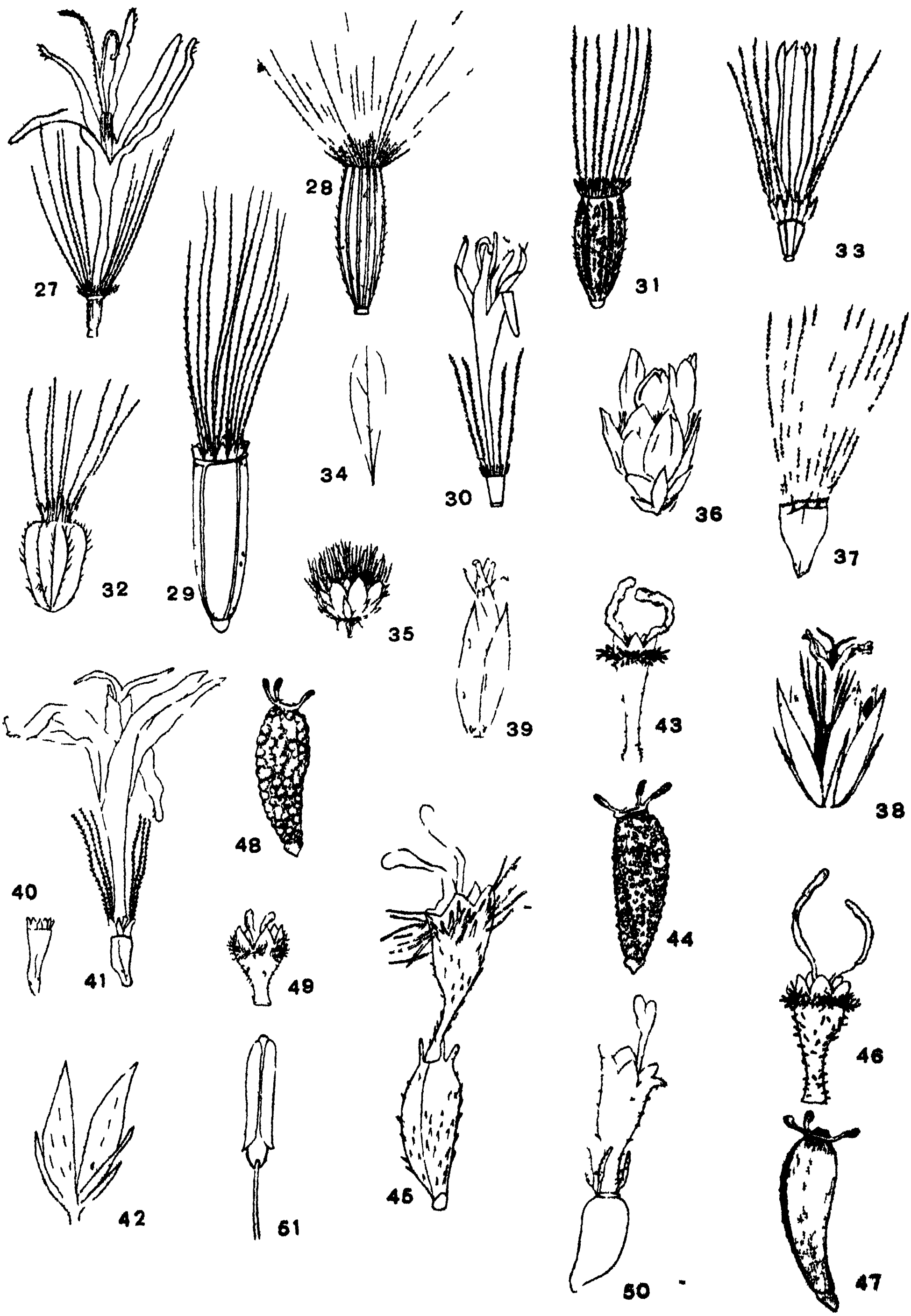
Pl. III.

27—28 *Vernonia lanceolata* (WARBG.) MATTF.: 27 flower, 28 achene with pappus; 29 *V. wetarensis* KOSTER: achene with pappus; 30—31 *V. floresiana* nov. spec.: 30 flower, 31 achene with pappus; 32 *V. letiensis* nov. spec.: achene with pappus; 33—35 *V. Zollingerianoides* SCH.-BIP.: 33 flower, 34 leaf, 35 head; 36—37 *V. actaea* KOSTER: 36 head, 37 achene with pappus; 38 *V. timorensis* nov. spec.: head; 39—42 *V. Walshae* nov. spec.: 39 head without outer row of the involucre, 40 achene with outer row of the pappus, 41 flower, 42 involucre; 43—44 *Adenostemma Lavenia* (L.) O. K.: 43 corolla with style, 44 achene with pappus; 45 *Adenostemma hirsutum* (BL.) DC.: flower; 46—47 *Adenostemma macrophyllum* (BL.) DC.: 46 corolla with style, 47 achene with pappus; 48—49 *Adenostemma parviflorum* (BL.) DC.: 48 achene with pappus, 49 corolla with style; 50—51 *Adenostemma Renschii* nov. spec.: 50 flower, 51 anther.

Pl. II.



Pl. III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Index to scientific names.

Heavy type indicates accepted groups.

Index of native names,

occurring on the herbarium labels.

Index to collectors' numbers,

indicating the genera, species, varieties and forms by means of their numbers; the first number is that of the genus, that in brackets indicates the species and the third number refers to the variety or the form.

4989 (B) = 5 (1) 2; 5132 (B) = 8 (3) 1; 5153 (B) = 1 (1); 5197 (B) = 9 (1); 5264 (B) = 4 (10) 1; 5338 (B) = 4 (17) 1; 5644 (B) = 10 (3); 5645 (B) = 11 (1) 2; 5712 (B) = 9 (2); 5724 (B) = 9 (2); 5805 (B) = 5 (1) 2; 5871 (B) = 10 (3); 5872 (B) = 8 (1) 1; 5943 (B) = 4 (18) 2; 6190 (B) = 8 (1) 1; 6244 (B) = 5 (1) 1; 6246 (L, B) = 4 (1) 2; 6255 (B) = 10 (1); 6446 (B) = 5 (1) 2; 6600 (B) = 5 (1) 2; 6654 (B) = 4 (18) 2; 6803 (B) = 2 (1); 6863 (B) = 4 (18) 2; 6987 (B) = 4 (10) 2; 7080 (B) = 1 (1); 7141 (B) = 8 (1) 1; 7259 (B) = 4 (1) 2, 7276 (B) = 4 (18) 1; 7411 (B) = 9 (1); 7502 (B) = 4 (10) 2; 7503 (B) = 4 (18) 1; 7505 (B) = 8 (1) 1; 7589 (B) = 4 (18) 2; 7682 (B) = 9 (1); 7841 (B) = 1 (1); 7842 (B) = 11 (1) 2; 7959 (B) = 9 (1); 7964 (B) = 4 (10) 1; 8062 (B) = 4 (10) 1; 8078 (B) = 4 (18) 2; 8176 (B) = 4 (18) 2; 8224 (B) = 4 (20); 8296 (B) = 4 (20); 8416 (B) = 5 (1) 2; 8538 (B) = 11 (1) 2; 8571 (L, B) = 11 (1) 2; 8623 (B) = 4 (17) 1; 8922 (B) = 8 (2); 9094 (B, K) = 10 (3); 9225 (B) = 11 (1) 2; 9325 (B) = 9 (1); 9586 (B) = 4 (17) 4; 9743 (L) 8 (1) 1; 10048 (B) = 4 (10) 2; 10058 (B) = 9 (1); 10087 (B) = 10 (3); 10353 (B) = 8 (2); 10476 (B) = 4 (1) 2; 10506 (B) = 10 (3); 10510 (B) = 4 (1) 2; 10588 (B) = 8 (2); 10657 (B) = 9 (1); 10919 (B) = 10 (3); 11169 (L) = 8 (2); 11264 (B) = 4 (18) 2; 11560 (B) =4 (1) 2; 11684 (B) = 9 (1); 11701 (B) = 5 (1) 2; 11758 (B) = 5 (1) 1; 11856 (B) = 4 (18) 2; 11868 (B) = 8 (8) 1; 12129 (B) = 4 (10) 2; 12181 (B) = 5 (1) 1; 12219 (B) = 8 (2); 12314 (B) = 4 (1) 2; 12469 (B) = 10 (2); 12524 (B) = 10 (2); 12532 (B) = 9 (2); 12635 (B) = 10 (3); 12987 (B) = 9 (1); 13152 (B) = 9 (1); 13216 (B) = 5 (1) 2; 13296 (B) = 4 (17) 4; 13423 (B) = 1 (1); 13469 (B) = 10 (3); 13478 (B) = 4 (18) 1; 13481 (B) = 8 (1) 1; 13500 (B) = 9 (2); 13509 (L) = 10 (2); 13517 (B) = 10 (7); 13548 (B) = 10 (2); 13596 (B) = 10 (3); 13760 (B) = 5 (1) 2; 13778 (B) = 4 (18) 1; 13779 (B) = 1 (1); 13848 (L) = 8 (1) 1; 13898 (B) = 11 (1) 2; 13906 (B) = 9 (1); 13929 (B) = 10 (3); 13959 (B) = 4 (10) 1; 14073 (B) = 8 (2); 14080 (B) = 10 (3); 14176 (B) = 4 (17) 1; 14233 (B) = 11 (1) 2; 14255 (B) = 9 (1); 14348 (B) = 4 (10) 1; 14362 (B) = 4 (18) 1; 14470 (L) = 8 (4); 14539 (B) = 10 (3); 14551 (B) = 5 (1) 2; 14580 (B) = 4 (17) 1; 14590 (B) = 9 (1); 14620 (B) = 9 (2); 14627 (B) = 4 (18) 1; 14779 (B) = 8 (2); 14819 (B) = 10 (3); 14981 (B)= 8 (4); 15055 (B) = 4 (18) 1; 15181 (B) = 10 (3); 15191 (B) = 4 (17) 1; 15235 (B) = 5 (1) 2; 15385 (B) = 4 (10) 2; 15390 (B) = 9 (1); 15395 (B) = 5 (1) 2; 15423 (B) = 4 (18) 1; 15442 (B) = 4 (10) 2; 15467 (B) = 5 (1) 2; 15487 (B) = 1 (1); 15565 (B) = 9 (1); 15568 (B) = 4 (10) 1; 15601 (B) = 11 (1) 2; 15614 (B) = 5 (1) 2; 15731 (B) = 8 (2); 15760 (B) = 11 (1) 2; 15766 (B) = 11 (1) 2; 15813 (B) = 4 (17) 2; 16122 (B) = 4 (17) 2; 16174 (B) = 8 (4); 16196 (B) = 5 (1) 1; 16316 (B) = 4 (10) 2; 16355 (B) = 5 (1) 1; 16702 (B) = 4 (10) 2; 16814 (B) = 4 (10) 2; 16934 (B) = 9 (1); 16935 (B) = 10 (3); 17148 (B) = 5 (1) 1; 17151 (L) = 8 (2); 17215 (B) = 4 (10) 3; 17264 (B) = 10 (3); 17408 (B) = 4 (10) 2; 17408 (B) = 9 (1); 17528 (B) = 8 (1) 1; 17722 (B) = 4 (10) 1; 17772 (B) = 4 (18) 2; 17779 (B) = 5 (1) 2; 18061 (B) = 4 (10) 1; 18099 (B). = 1 (1); 18179 (B) = 9 (1); 18433 (B) = 9 (1); 18474 (B) = 5 (1) 2; 18475 (B) = 4 (1) 2; 18546 (B) = 4 (18) 1; 18550 (B) = 8 (1) 1; 18568 (B) = 4 (10) 2; 18721 (B) = 8 (1) 1; 18776 (B) = 4 (10) 1;

19060 (B) = 4 (18) 2; 19069 (B) = 5 (1) 2; 19277 (B) = 4 (10) 2; 19357 (B) = 9 (1); 19369 (B) = 4 (18) 2; 19520 (B) = 4 (18) 2; 19690 (L, B) = 5 (1) 2; 19705 (B) = 9 (1); 19710 (B) = 4 (10) 2; 19856 (L, B) = 5 (1) 2; 20237 (B) = 4 (9); 20265 (B) =9 (1); 20276 (B) = 4 (18) 2; 20344 (B) = 4 (18) 2; 20486 (L) = 4 (9); 20622 (B) = 4 (18) 2; 20629 (B) = 5 (1) 2; 20798 (B) = 4 (9); 20890 (B) = 5 (1) 1; 21236 (B) = 4 (18) 2; 21337 (B) = 4 (10) 2; 21338 (B) = 4 (10) 2; 21339 (B) = 9 (1); 21340 (B) = 9 (1); 21341 (B) = 9 (1); 21343 (B) = 4 (10) 2; 21347 (B) = 9 (1); 21349 (B) = 9 (1); 21350 (B) = 9 (1); 21355 (B) = 9 (1); 21367 (B) = 4 (10) 1; 21368 (B) = 4 (10) 2; 21374 (B) = 7 (1); 21511 (B) = 5 (1) 1; 21521 (L) = 8 (2); 21534 (B) = 10 (7); 21627 (B) = 4 (17) 2; 21759 (B) = 9 (1); 21768 (B) = 8 (4); 21851 (B) = 4 (17) 2; 21983 (B) = 9 (1); 22204 (B) = 1 (1); 22214 (B) = 10 (2); 22330 (B) = 9 (2); 22378 (B) = 8 (2); 22717 (B) = 11 (1) 2; 22837 (B) = 7 (1); 22841 (L, K) = 6 (1); 22855 (B) = 8 (2); 22914 (B) = 4 (18) 1; 23336 (B) = 1 (1); 23552 (B) = 10 (3); 23556 (B) = 4 (10) 3; 23572 (B) = 9 (1); 23637 (B) = 8 (1) 1; 23913 (B) = 5 (1) 2; 23995 (B) = 10 (7); 24023 (B) = 4 (18) 1; 24028 (B) = 8 (1) 1; 24170 (B) = 4 (18) 2; 24183 (B) = 4 (20); 24310 (B) = 4 (18) 2; 24376 (B) = 4 (10) 2; 24432 (B) = 4 (18) 2; 24437 (B) = 8 (1) 1; 24460 (B) = 9 (1); 24503 (B) = 4 (20); 24529 (B) = 5(1) 1; 24677 (B) = 4 (20); 24752 (B) = 4 (18) 2; 24784 (B) = 9 (1); 24868 (B) = 5 (1) 1; 24886 (B) = 9 (1); 24899 (B) = 11 (1) 2; 24944 (B) = 4 (18) 2; 24945 (B) = 4 (20); 25116 (L, B) = 11 (1) 3; 25137 (B) = 4 (17) 2; 25267 (B) = 4 (17) 2; 25303 (B) = 2 (1); 25346 (B) = 5 (1) 1; 25386 (B) = 11 (1) 2; 25625 (B) = 5 (1) 2; 25853 (B) = 11 (1) 2; 25871 (L, B) = 4 (1) 2; 25919 (B) = 10 (3); 26051 (L) = 10 (7); 26077 (L) = 9 (1); 26077 (L) = 9(2); 26401 (B) = 8 (1) 1; 26868 (B) = 4 (10) 2; 26869 (B) = 9 (1); 26984 (B) = 5 (1) 2; 27256 (B) = 4 (18) 2; 27302 (B) = 9 (1); 27499 (B) = 4 (10) 2; 27591 (B) = 9 (1); 28003 (B) = 9 (1); 28034 (B) = 4 (18) 2; 28110 (B) = 4 (9); 28213 (B) = 4 (18) 2; 28228 (B) = 9 (1); 28282 (B) = 5 (1) 2; 28402 (B) = 4 (10) 2; 28462 (B) = 4 (10) 2; 28463 (B) = 4 (9); 28467 (B) = 4 (18) 2; 28490 (B) = 5 (1) 2; 28542 (B) = 9 (1); 28621 (B) = 4 (9); 28708 (B) = 4 (18) 2; 28747 (B) = 4 (9); 28775 (B) = 4 (9); 28785 (B) = 5 (1) 2; 28794 (B) = 9 (1); 28852 (B) = 4 (18) 1; 29092 (B) = 4 (18) 2; 29156 (B) = 9 (1); 29243 (B) = 4 (9); 29284 (B) = 4 (18) 2; 29302 (B) = 4 (9); 29308 (B) = 4 (18) 2; 29328 (B) = 5 (1) 1; 29337 (B) = 9 (1); 29515 (B) = 4 (10) 1; 29644 (B) = 5 (1) 2; 29648 (B) = 4 (9); 29692 (B) = 9 (1); 29731 (B) = 4 (18) 2; 29993 (B) = 4 (10) 3; 30115 (B) = 4 (10) 2; 30137 (B) = 9 (1); 30248 (B) = 4 (17) 2; 30277 (B) = 8 (3) 3; 30347 (B) = 4 (10) 2; 30459 (L) = 4 (1) 4; 31019 (B) = 4 (10) 2; 31335 (B) = 10 (7); 31601 (B) = 4 (10) 2; 31787 (B) = 11 (1) 2; 31920 (B) = 10 (3); 31922 (B) = 10 (3); 32021 (B) = 1 (1); 32026 (B) = 1 (1); 32030 (B) = 1 (1); 32032 (B) = 1 (1); 32403 (B) = 10 (2); 32420 (B) = 10 (7); 32930 (B) = 4 (18) 1; 32933 (B) = 4 (18) 1; 33020 (B) = 8 (1) 1; 33023 (B) = 8 (2); 33513 (B) = 10 (3); 33515 (B) = 10 (3); 33516 (B) = 10 (3); 33517 (B) = 10 (3); 33518 (B) = 10 (3); 35147 (B) = 8 (1) 1; 41338 (B) = 4 (10) 1; 86922 (B) = 9 (2); s.n. (B) = 4 (1) 2; s.n. (B) = 4 (17) 1; s.n. (B) = 4 (18) 2; s.n. (B) = 5 (1) 2; s.n. (L) =

5 (1) 1; s.n. (L, B, U) = 8 (1) 1; s.n. (B) = 8 (2); s.n. (L, U, B) = 8 (2); s.n. (B) = 11 (1) 2.

BACKER and VAN SLOOTEN: 25084 (B) = 4 (10) 2.

BAKHUIZEN VAN DEN BRINK: 15a (L) = 10 (3); 36 (L) = 4 (1) 2; 45 E (L) = 11 (1) 4; 46 (B) = 4 (10) 2; 56 (B) = 4 (18) 1; 75a (L) = 4 (10) 3; 335 (B) = 4 (18) 1; 374 (B) = 7 (1); 433 (B) = 8 (1) 1; 457 (L) = 5 (1) 1; 499 (B) = 11 (1) 2; 531 (B) = 11 (1) 2; 628 (B) = 4 (17) 1; 654 (L) = 1 (1); 716 (B) = 9 (2); 747 (B) = 11 (1) 2; 1016 (B) = 1 (1); 1023 (B) = 9 (1); 1024 (B) = 9 (2); 1121 (B) = 8 (1) 1; 1460 (L, B) = 7 (1); 1629 (B) = 4 (10) 2; 1918 (L) = 11 (1) 2; 1934 L, K) = 6 (1); 1934 (L, B) = 8 (2); 2006 (B) = 9 (2); 2111 (B) = 1 (1); 2179 (B) = 4 (18) 1; 2443 (B) = 11 (1) 2; 2888 (B) = 9 (2); 2981 (L) = 10 (3); 2983 (L) = 9 (1); 2996 (L) = 11 (1) 2; 3181 (B) = 8 (1) 1; 3194 (B) = 4 (10) 1; 3388 (L) = 10 (1); 3676 (L, U) = 4 (18) 1; 3721 (B) = 4 (10) 3; 3815 (B) = 4 (10) 2; 3816 (B) = 9 (1); 3821 (L) = 7 (1); 3889 (L) = 4 (1) 2; 4320 (L, K) = 4 (17) 1; 4333 (L) = 8 (4); 4652 (B) = 4 (17) 1; 4705 (B) = 11 (1) 2; 4725 (L) = 11 (1) 2; 4781 (L) = 8 (4); 5056 (B) = 5 (1) 1; 5072 (L) = 5 (1) 1; 5561 (B) = 9 (1); 5733 (L, B) = 4 (18) 1; 5781 (L, K) = 9 (2); 5782 (L) = 9 (1); 6030 (L) = 7 (1); 6344 (L) = 7 (1); 6386 (B) = 4 (10) 1; 6550 (L) = 10 (3); 6895 (L) = 4 (10) 3; 6896 (B) = 4 (18) 2; 7160 (B) = 1 (1); 7451 (L) = 11 (1) 2; 7930 (B) = 5 (1) 2.

BARTER: s.n. (K) = 4 (1) 6.

BARTLETT: s.n. (Br. M.) = 4 (1) 6.

BARTLETT and LA RUE: 146 (L) = 8 (2); 150 (K) = 4 (18) 1; 234 (L) = 4 (1) 5; 284 (L) = 9 (1); 332 (L) = 5 (1) 2; 387 (L) = 4 (10) 1; 396 (L) = 9 (1).

BECCARI: 288 (B, K) = 4 (1) 6; 341 (L) = 4 (1) 1; 459 (K) = 11 (1) 2; 824 (K) = 9 (1); s.n. (L, K) = 8 (4).

BEGUIN: 65 (B) = 9 (1); 404 (L, B) = 5 (1) 2; 796 (B) = 5 (1) 2; 821 (B) = 4 (10) 2; 895 (B) = 9 (1); 966 (B) = 8 (1) 1; 1015 (B) = 11 (1) 2; 1111 (B) = 11 (1) 2; 1163 (B) = 4 (1) 6; 1468 (L, B) = 4 (1) 6.

BERCK: s.n. (B) = 8 (1) 1.

DEN BERGER: 94 (B) = 4 (17) 2; 95 (B) = 8 (3) 2; 553 (B) = 4 (1) 3; 606 (B) = 10 (2); 629 (B) = 10 (7); s.n. (B) = 10 (2).

BEUMÉE: 192 (B) = 4 (10) 2; 195 (B) = 9 (1); 378 (B) = 5 (1) 2; A 615 (B) = 8 (1) 1; A 631 (B) = 4 (17) 4; 634 (B) = 9 (1); 637 (B) = 4 (18) 1; 808 (B) = 4 (10) 6; 812 (B) = 4 (10) 1; 874 (B) = 11 (1) 2; 885 (B) = 5 (1) 2; 937 (B) = 9 (1); 1107 (B) = 11 (1) 2; 1164 (B) = 4 (10) 2; 1197 (B) = 8 (1) 1; 1905 (B) = 8 (1) 1; 2228 (B) = 9 (1); 2346 (B) = 8 (1) 1; 2366 (B) = 5 (1) 1; 2432 (B) = 5 (1) 2; 2438 (B) = 9 (1); 2615 (B) = 4 (18) 2; 2780 (B) = 4 (20); 2788 (B) = 5 (1) 2; 2826 (B) = 4 (18) 2; 2848 (B) = 5 (1) 2; 3650 (B) = 9 (1); 3694 (B) = 5 (1) 2; 3697 (B) = 4 (10) 2; 3726 (B) = 1 (1); 3781 (B) = 4 (10) 2; 3945 (B) = 4 (18) 1; 3958 (B) = 5 (1) 2; 4102 (B) = 8 (1) 1; 4292 (B) = 9 (1); 4575 (B) = 4 (10) 2; 4596 (B) = 9 (1); 4854 (B) = 8 (1) 1; 5018 (B) = 4 (10) 2; 5100 (B) = 4 (18) 1; 5211 (B) = 9 (1); 5227 (B) =

5 (1) 2; 5299 (B) = 9 (1); 5350 (B) = 8 (1) 1; 5406 (B) = 4 (18) 1; 5416 (B) = 5 (1) 2; 6772 (B) = 11 (1) 2.

BINNENDIJK: s.n. (B) = 4 (27); s.n. (B) = 11 (1) 2; s.n. (B) = 4 (10) 4.

BLOKHUIS: 60 (B) = 9 (1); s.n. (B) = 4 (17) 2; s.n. (B) = 4 (18) 1; s.n. (B) = 4 (18) 2; s.n. (B) = 4 (18) 3; s.n. (B) = 5 (1) 1; s.n. (B) = 9 (1).

BLUME: 443 (L) = 8 (4); 1436 (L) = 4 (1) 2; 1443 (L) = 4 (17) 2; 1838 (L) = 8 (1) 1; s.n. (L) = 3 (1) 1; s.n. (Br. M.) = 3 (1) 1; s.n. (L) = 4 (1) 1; s.n. (L) = 4 (1)2; s.n. (L) = 4 (1) 3; s.n. (L) = 4 (1) 9; s.n. (L) = 4 (17) 1; s.n. (L) = 4 (18) 1; s.n. (L) = 4 (18) 2; s.n. (L) = 4 (19); s.n. (L) = 8 (1) 1; s.n. (L) = 8 (2); s.n. (L) = 8 (3) 1; s.n. (L) = 8 (4); s.n. (L) = 9 (1); s.n. (L, Br. M.) = 10 (1); s.n. (L) = 11 (1) 2.

DE BOER: 3 (B) = 5 (1) 2; 14 (B) = 9 (1); 26 (B) = 4 (18) 3.

BOERLAGE: 228 (B) = 4 (10) 1; s.n. (L) = 1 (1); s.n. (L) = 3 (1) 3; s.n. (L, B) = 4 (10) 2; s.n. (L, B) = 4 (17) 1; s.n. (L) = 4 (18) 1; s.n. (L) = 4 (18) 2; s.n. (L) = 8 (1); s.n. (L) = 8 (4); s.n. (L) = 10 (3); s.n. (L) = 11 (1) 2.

BARCLAY: s.n. (Br. M.) = 9 (1).

BOSCHMA: 14 (B) = 4 (10) 2; 66 (B) = 9 (1); 78 (B) = 4 (10) 2.

BOSCHPROEFSTATION: 2 (B) = 4 (1) 2; 7 (B) = 4 (1) 2; 8 (B, U) = 4 (1) 2; 1333 (B) = 4 (1) 2; 1418 (B) = 4 (1) 2; 1798 (B) = 4 (1) 4; 1809 (B) = 4 (1) 2; 1832 (B) = 4 (1) 6; 2154 (B) = 4 (1) 2; 2767 (B) = 4 (1) 13; 3834 (L, B) = 4 (1) 2; 3893 (B) = 4 (1) 6; 4164 (L, B) = 4 (1) 5; 4878 (L, B) = 4 (1) 1; 4888 (L, B) = 4 (1) 5; 5168 (B) = 4 (1) 2; 5258 (B) = 4 (1) 2; 5424 (L, B, K) = 4 (1) 6; 5463 (B) = 4 (1) 9; 5503 (B) = 4 (1) 2; 5519 (B) = 4 (1) 13; 5639 (L, B) = 4 (1) 5; 5825 (B) = 4 (1) 2; 5841 (B) = 4 (1) 13; 6006 (B) = 4 (1) 1; 6091 (B) = 4 (1) 2; 6231 (B) = 4 (1) 13; 6673 (B) = 4 (1) 13; 6908 (B) = 4 (1) 2; 7621 (B) = 4 (1) 2; 8112 (B) = 4 (1) 2; 8134 (B) = 4 (1) 2; 8403 (B) = 4 (1) 2; 8616 (B) = 4 (1) 13; 8681 (B) = 4 (1) 2; 9546 (B) = 4 (1) 6; 10347 (B) = 4 (1) 2; 10455 (B) = 4 (1) 2; 10604 (B) = 4 (1) 6; 12635 (B) = 4 (1) 6; 13917 (B) = 4 (1) 6; 13992 (B) = 4 (1) 2; 14161 (B) = 4 (1) 6; 15413 (B) = 4 (1) 2.

BOUMAN—HOUTMAN: 10 (B) = 4 (19); 56 (B) = 9 (1); 69 (B) = 4 (10) 3; s.n. (B) = 4 (20).

BREMEKAMP: s.n. (B) = 2 (1); s.n. (B) = 4 (1) 2; s.n. (B) = 4 (17) 2; s.n. (B) = 8 (1) 1; s.n. (B) = 11 (1) 2.

BRINKMAN: 8 (B) = 4 (10) 2; 36 (B) = 9 (1); 45 (B) = 1 (1); 181 (B) = 4 (17) 2; 301 (B) = 4 (18) 1.

BROWN: s.n. (L, Br. M.) = 4 (20); s.n. (Br. M.) = 8 (1) 1.

BRUGGEMAN: 189 (B) = 4 (17) 1; 270 (B) = 10 (7).

BRUINIER: 23 (B) = 4 (10) 1; 26 (B) = 9 (1).

BULJSMAN: 106 (L) = 11 (1) 2; 2771 (U) = 9 (1); s.n. (U) = 4 (10) 1; s.n. (U) = 4 (18) 2; s.n. (U) = 5 (1) 1.

BÜNNEMEYER: 60 (B) = 5 (1) 1; 146 (B) = 9 (1); 269 (B) = 4 (10) 1; 270 (B) = 8 (1) 1; 308 (B) = 11 (1) 4; 433 (B) = 11 (1) 2; 592 (B) = 8 (4); 699 (B) = 8 (4); 791 (B) = 8 (4); 793 (B) = 4 (4); 944 (B) = 8 (4); 1017 (L) = 9 (1); 1040 (L) = 9 (1); 1061 (L) = 10 (3); 1222 (B) = 9 (1); 1256 (B) = 4 (17) 1; 1299 (B) = 8 (2); 1301 (B) = 4 (17) 1; 1335 (B) =

9 (1); 1367 (L) = 9 (1); 1422 (L) = 4 (10) 2; 1606 (L) = 9 (1); 1704 (L) = 1 (1); 1975 (B) = 1 (1); 2272 (B) = 4 (10) 1; 2279 (L) = 1 (1); 2343 (B) = 4 (10) 1; 2523 (K) = 4 (10) 1; 2523 (L) = 4 (17) 1; 2578 (L) = 4 (17) 1; 2580 (L) = 8 (4); 2589 (B) = 4 (17) 1; 2590 (B) = 9 (1); 2625 (B) = 8 (4); 2648 (B) = 8 (4); 2843 (B) = 8 (4); 2976 (B) = 4 (17) 1; 2979 (L) = 11 (1) 3; 3024 (L) = 8 (2); 3025 (L) = 11 (1) 2; 3034 (B) = 9 (1); 3216 (B) = 8 (2); 3288 (B) = 4 (17) 1; 3406 (L) = 11 (1) 2; 3408 (L) = 4 (17) 1; 3514 (L) = 4 (17) 1; 3655 (B) = 4 (18) 1; 3702 (L) = 11 (1) 4; 3865 (B) = 8 (4); 3890 (B) = 8 (4); 4062 (L) = 4 (4); 4332 (L) = 4 (1) 2; 4451 (B) = 4 (10) 1; 4521 (L, U) = 4 (17) 1; 4522 (B) = 8 (4); 4570 (L) = 8 (4); 4637 (B) = 4 (1) 2; 4676 (B) = 4 (4); 4754 (B) = 8 (4); 4778 (L) = 4 (17) 1; 4809 (L) = 9 (1); 4820 (B) = 11 (1) 4; 5000 (B) = 4 (4); 5096 (L) = 9 (1); 5176 (L) = 4 (17) 1; 5331 (L) = 11 (1) 3; 5602 (L) = 8 (4); 5987 (B) = 8 (1) 1; 5988 (L) = 4 (10) 1; 6105 (L) = 8 (1) 1; 6107 (L) = 9 (1); 6120 (L) = 4 (10) 1; 6246 (B) = 4 (10) 1; 6251 (L) = 9 (1); 6326 (B) = 5 (1) 2; 6404 (L) = 5 (1) 1; 6443 (B) = 9 (1); 6505 (L, U, K) = 4 (18) 1; 6563 (B) = 9 (1); 6598 (B) = 4 (10) 1; 6641 (L) = 8 (1) 1; 6641 (L, B) = 9 (1); 6754 (L) = 1 (1); 6766 (L, K) = 4 (18) 1; 6771 (L) = 4 (10) 1; 6813 (B) = 5 (1) 2; 6979 (B) = 4 (10) 1; 7039 (L) = 4 (18) 1; 7041 (B) = 9 (1); 7101 (B) = 8 (1) 1; 7102 (B) = 9 (1); 7103 (B) = 4 (10) 1; 7174 (B) = 4 (10) 2; 7295 (L) = 5 (1) 4; 7302 (L) = 1 (1); 7432 (B) = 9 (1); 7434 (L) = 4 (10) 1; 7489 (B) = 9 (1); 7579 (B) = 4 (10) 1; 7711 (L) = 4 (10) 1; 7715 (B) = 9 (1); 7783 (B) = 8 (1) 1; 7784 (L, K) = 1 (1); 7791 (L, B, U) = 4 (1) 8; 7796 (L) = 5 (1) 4; 7817 (B) = 9 (1); 7868 (L) = 5 (1) 1; 7927 (L, K, U) = 4 (18) 1; 7928 (L) = 4 (10) 1; 7933 (U, B) = 9 (1); 7945 (B) = 5 (1) 1; 8066 (B) = 8 (4); 8085 (B) = 11 (1) 2; 8188 (B) = 8 (2); 8260 (B) = 4 (18) 1; 8312 (B) = 4 (1) 2; 8696 (L, U, B) = 4 (1) 2; 8760 (U) = 8 (2); 8848 (B) = 8 (4); 8971 (B) = 4 (1) 2; 8998 (L, B, K) = 4 (1) 10; 9088 (B) = 4 (1) 10; 9125 (B, L) = 8 (4); 9149 (L) = 9 (1); 9160 (B, U) = 4 (1) 10; 9169 (B) = 8 (4); 9438 (L) = 8 (2); 9668 (B) = 8 (4); 9861 (B) = 8 (4); 10255 (L) = 8 (4); 10316 (L) = 8 (4); 10426 (B) = 8 (4); 10550 (B) = 8 (4); 10551 (B) = 8 (4); 10557 (L) = 9 (1); 10570 (B) = 4 (10) 2; 10697 (B) = 5 (1) 1; 10719 (B) = 9 (1); 10723 (B) = 4 (11); 10814 (B) = 4 (10) 3; 10895 (B) = 4 (15); 10957 (B) = 4 (10) 3; 11037 (L) = 11 (1) 2; 11163 (B) = 8 (4); 11243 (L) = 8 (4); 11252 (L) = 11 (1) 3; 11256 (B) = 4 (10) 3; 11349 (B) = 5 (1) 1; 11359 (B) = 4 (10) 3; 11496 (L) = 4 (11); 11530 (L) = 4 (15); 11603 (L) = 11 (1) 3; 11609 (L) = 9 (1); 11618 (B) = 8 (4); 11640 (B) = 4 (10) 3; 11648 (B) = 4 (15); 11678 (L) = 5 (1) 2; 11701 (L, B) = 4 (1) 9; 11705 (L, K) = 11 (1) 2; 11713 (L) = 8 (4); 11783 (B) = 4 (15); 11809 (L) = 11 (1) 2; 11820 (B) = 8 (4); 11821 (B) = 8 (4); 11841 (L) = 8 (4); 11982 (L, B, U, K) = 4 (1) 9; 12005 (B) = 11 (1) 2; 12119a (B) = 9 (1); 12121 (B) = 11 (1) 2; 12401 (B) = 4 (11); 12439 (B) = 5 (1) 2; 12485 (L) = 4 (18) 1; 12515 (B) = 5 (1) 2; 12518 (B) = 4 (10) 3; 12622 (B) = 8 (2).

BURBIDGE: s.n. (Br. M.) = 9 (1); s.n. (K) = 11 (1) 1.

BURCK: 96 (B) = 11 (1) 2; 123 (B) = 11 (1) 2; 147 (B) = 4 (17) 1; 216 (L) = 8 (3) 1; s.n. (B) = 4 (10) 1; s.n. (B) = 4 (18) 1; s.n. (B) = 8 (1) 1; s.n. (B) = 9 (1); s.n. (B) = 10 (3).

BURCK and DE MONCHY: s.n. (B) = 4 (10) 2; s.n. (B) = 5 (1) 2; s.n. (B) = 8 (1) 1; s.n. (B) = 8 (2); s.n. (B) = 10 (3); s.n. (B) = 11 (1) 4.

BURGER: 6677 (B) = 4 (1) 2.

CASTRO and MELEGRITO: 1356 (K) = 4 (29); 1487 (B) = 4 (1) 5; 1508 (B, Br. M.) = 4 (1) 5; 1515 (Br. M.) = 4 (29); 1699 (B) = 8 (1) 1.

CLASON—LAARMAN: F. 29 (B) = 8 (4); G. 30 (B) = 4 (20); F. 49 (B) = 4 (20); D. 89 (B) = 4 (17) 2; F. 114 (B) = 11 (1) 3; F. 117 (B) = 4 (17) 2; 123 (B) = 8 (3) 2.

CLEMENS: 9774 (K) = 11 (1) 1; 11176 (B) = 4 (1) 6; 11207 (B) = 4 (1) 6; 11239 (B, K) = 9 (1); 21433 (B) = 4 (10) 1; 22182 (B, K) = 4 (1) 6; 26873 (L, B, K) = 4 (1) 6; 27318 (K, B) = 11 (1) 2; 28431 (L, B, K) = 4 (1) 1; 28604 (L, B, K) = 4 (29); 28875 (B) = 4 (1) 1; 28993 (L, B, K) = 4 (1) 1; 29263 (L, B, K) = 4 (1) 1; 29951 (L, B, K) = 4 (1) 1; 30537 (L, B) = 4 (1) 6; 30758 (L, B) = 4 (1) 1; 30955 (L, B) = 4 (1) 1; 31495 (L, B) = 4 (1) 1; 32424 (B) = 8 (4); 32512 (L, B) = 4 (1) 1; 32682 (L, B) = 4 (1) 1; 32980 (B) = 4 (1) 1; 34161 (L, B) = 4 (1) 5; 34173 (B) = 4 (1) 1; 34175 (L) = 4 (1) 1; 34234 (B) = 8 (4); 40043 (B) = 4 (1) 1; s.n. (K) = 10 (2).

COOK: s.n. (Br. M.) = 4 (10) 2.

CORDES: s.n. (B) = 8 (1) 1.

CRAMER: 112 (B) = 8 (1) 1.

CREAGH: s.n. (Br. M.) = 4 (10) 2; s.n. (K) = 5 (2); s.n. (K, Br. M.) = 9 (1).

CUMING: 2428 (K) = 5 (1) 2; 2442 (K, Br. M.) = 4 (10) 1.

CURTIS: s.n. (K) = 4 (18) 2.

VAN DAALEN: 268 (L, B) = 4 (18) 1; 288 (L, B) = 4 (10) 6; s.n. (L) = 9 (1).

DANSER: 6776 (B) = 11 (1) 2.

DECAISNE: s.n. (L) = 4 (20); s.n. (L) = 5 (1) 2.

DELMAAR: 1914 (L, B) = 4 (1) 6.

DENKER: 11 (B) = 10 (3); 106 (B) = 11 (1) 2; 107 (B) = 4 (17) 1; 108 (L) = 3 (1) 2.

DIEPENHORST: s.n. (U, K) = 4 (1) 2.

DOCTERS VAN LEEUWEN: 30 (B, U) = 1 (1); 501 (B) = 1 (2); 771 (B, U) = 4 (18) 1; 774 (B, U) = 10 (1); 1320 (B, U) = 4 (32); 1362 (U, B) = 4 (18) 2; 1423 (B, U) = 4 (32); 1424 (U, B) = 4 (20); 1466 (B, U) = 4 (32); 1491 (U) = 8 (1) 1; 1491 (B) = 8 (1) 2; 1605 (U) = 9 (1); 1701 (B) = 5 (1) 2; 1711 (U) = 11 (1) 2; 1834 (U, B) = 4 (20); 1937 (B, U) = 4 (32); 2540 (B) = 8 (2); 2609 (L) = 4 (1) 2; 3168 (B) = 9 (1); 4278 (B) = 10 (7); 5124 (B) = 8 (1) 1; 5393 (B) = 4 (10) 1; 5420 (B) = 4 (1) 2; 5424 (B) = 1 (1); 8085 (L) = 10 (7); 8730 (B) = 2 (1); 8994 (B) = 4 (18) 2; 12470 (B) = 4 (17) 4; 71151 (L) = 11 (1) 2; s.n. (B) = 4 (10) 2; s.n. (B) = 4 (17) 1; s.n. (B) = 4 (18) 2; s.n. (B) = 9 (2).

DOCTERS VAN LEEUWEN—REYNVAAN 822 (U) = 5 (1) 1; 880 (U) = 5 (1) 1; 71243 (B) = 8 (1) 1; s.n. (U) = 4 (10) 2; s.n. (U) = 4 (17) 1; s.n. (U) = 5 (1) 2; s.n. (B) = 9 (1).

DOMMERS: 139 (B) = 5 (1) 1.

ELBERT: 28 (L) = 9 (1); 552 (L) = 4 (10) 1; 608 (L) = 4 (14); 688 (L) = 4 (14); 748 (L) = 4 (14); 773 (L) = 4 (8); 830 (L) = 4 (8); 1467 (L) = 4 (8); 1587 (L) = 4 (8); 1753 (L) = 10 (4); 1843 (L) = 11 (1) 2; 1907 (L) = 11 (1) 2; 1943 (L) = 4 (20); 2071 (L) = 4 (14); 2503 (L) = 4 (10) 1; 2569 (L) = 4 (32); 3211 (L) = 4 (11); 3499 (L) = 11 (1) 2; 3509 (L) = 4 (20); 3550 (L) = 4 (20); 3567 (L) = 11 (1) 2; 3629 (L) = 4 (20); 4403 (L) = 4 (21); 4511 (L) = 5 (1) 1; 6258 (L) = 11 (1) 2; 44109 (L) = 4 (10) 1; s.n. (L) = 2 (1).

ELMER: 20300 (L, Br. M., K) = 9 (1); 20731 (L, K, Br. M.) = 9 (1); 21030 (B, U, Br. M.) = 4 (1) 6; 21252 (K, U, B) = 8 (1) 1.

ENDERT: 1069 (L, B) = 4 (1) 10.

ERNST: s.n. (B) = 10 (7).

ETTY: s.n. (B) = 5 (1) 2.

EYKEN: s.n. (B) = 4 (18) 1.

FORBES: 49 (Br. M.) = 4 (10) 2; 133 (L) = 8 (2); 308 (B, Br. M.) = 4 (1) 2; 426 (B) = 11 (1) 2; 523 (L) = 4 (1) 6; 653 (L, K) = 4 (1) 6; 791 (Br. M. L, B) = 4 (1) 2; 950 (L) = 3 (1) 1; 950 (Br. M.) = 3 (1) 2; 964 (Br. M.) = 3 (1) 2; 973b (Br. M.) = 3 (1) 2; 990a (L, Br. M.) = 4 (1) 2; 1132c (Br. M.) = 8 (3) 1; 1402 (Br. M.) = 4 (30); 2680a (L) = 11 (1) 4; 2690 (L, Br. M.) = 4 (1) 2; 2900 (L, Br. M.) = 4 (1) 1; 3357 (Br. M.) = 4 (10) 2; 3816 (B) = 4 (14); 4059 (L, K) = 4 (14); s.n. (L) = 4 (11); s.n. (Br. M.) = 9 (1).

FORSTEN: s.n. (L) = 4 (10); s.n. (L) = 4 (18) 1; s.n. (L) = 11 (1) 2.

FREY WYSSLING: 55 (B) = 8 (1) 4.

FRIJLINCK: 5 (B) = 9 (1); 15 (B) = 5 (1) 2.

GALOENGI: 3 (B) = 4 (18) 1; 7 (B) = 9 (1); 441 (B) = 4 (1) 2.

GIBBS: 2739 (K) = 11 (1) 1; 2973 (K, Br. M.) = 4 (1) 6; 4118 (K, Br. M.) = 8 (4).

GJELLERUP: 413 (L, B, K, U) = 4 (1) 6.

GOBLIN: 2498 (K) = 4 (1) 6.

VAN DER GOOT: s.n. (B) = 4 (1) 2.

GRABOWSKY: s.n. (Br. M.) = 4 (10) 1; s.n. (Br. M.) = 9 (1).

GRESHOFF: s.n. (B) = 4 (10) 2.

GRÜNDLER: 3453 (L) = 4 (5); 3843 (L) = 4 (20).

GRUTTERINK: 3047 (B) = 8 (1) 1; 3103 (B) = 11 (1) 3.

GUSDORF: 125 (L) = 4 (1) 2; 125 (L, B) = 4 (1) 5.

HALLIER: 80 (B) = 4 (17) 1; 109 (B) = 11 (1) 2; 154a, b, c, d, (B) = 1 (1); 155a (B) = 4 (18) 1; 156 (L) = 4 (10) 2; 156a (B, L) = 4 (10) 2; 157 (L, B) = 5 (1) 2; 157b (L) = 5 (1) 2; 157c (B) = 5 (1) 1; 157c (L)= 5 (1) 2; 158 (B) = 8 (1) 1; 158 (L) = 8 (2); 158c , g (L) = 8 (2); 158g (B) = 9 (1); 159a, b, c (B) = 9 (1); 162a, b (B) = 10 (3); 194 (L) = 4 (10) 2; 303 (L, B) = 4 (1) 6; 320 (B) = 10 (3); 382 (B) = 8 (1) 1; 382 (L) = 8 (2); 382 (L) = 8 (4); 416 (B) = 4 (1) 3; 442 (B) = 4 (17) 1; 449 (B) = 8 (4); 612 (B) = 11 (1) 2; 636 (B) = 9 (1); 776 (B) = 4 (18) 2; 899 (L, B) = 4 (1) 6; 1297 (L, B) = 4 (1) 6; 1613 (L, B) = 4 (1) 6; 1858 (L, B, K) = 4 (1) 11; 2497 (L, B, K) = 4 (1) 6; 2962 (L, B) = 4 (1) 2; s.n. (B) =4 (10) 3; s.n. (B) = 4 (17) 1; s.n. (B) = 4 (18) 2; s.n. (B) = 7 (1); s.n. (B) = 11(1) 4.

HARMSEN: 10 (B) = 4 (10) 2; 52 (B) = 9 (1); 75 (B) = 5 (1) 2.

VAN HARREVELD—LAKO: 88 (B) = 9 (1).

HASSKARL: s.n. (L) = 4 (1) 2.

HAVILAND: 88 (K) = 4 (1) 6; 3023 (K) = 9 (1); 3024 (K, L) = 4 (10) 20; 3608 (K) = 4 (10) 1; s.n. (K) = 11 (1) 2.

HAVILAND and HOSE: s.n. (L) = 11 (1) 2.

HEERING: s.n. (B) = 9 (1).

HEMKEN: s.n. (B) = 4 (10) 2; s.n. (B) = 4 (18) 1; s.n. (B) = 9 (1).

HENDERSON: 20483 (B, K) = 1 (1); 20486 (B) = 9 (1).

HEYNE: 18 (B) = 4 (1) 8; s.n. (Br. M.) = 9 (1).

HOCHREUTINER: 25 (G) = 10 (3); 1199 p. p. (G) = 8 (3) 1; 1199 p. p. (G) = 8 (4); 2738 (G) = 4 (17) 2.

HOFSTEE: 4 (B) = 5 (1) 2; 41 (B) = 9 (1).

HORSFIELD: 7 (K) = 4 (1) 2; 9 (K) = 3 (1) 2; 10 (K) = 11 (1) 2; 12 (K) = 4 (18) 1; 13 (K) = 4 (17) 1; 14 (K) = 4 (18) 2; 16 (K) = 4 (10) 2; 17 (K) = 4 (10) 2; 18 (K) = 4 (10) 5; 31 (K, Br. M.) = 10 (5); 64 (Br. M. = 4 (1) 2; 70 (K) = 8 (1) 1; 71 (K) = 8 (4); 74 (B) = 10 (1); s.n. (L, K, U) = 4 (1) 4; s.n. (U) = 4 (10) 2; s.n. (U) = 4 (10) 5; s.n. (U) = 4 (17) 2; s.n. (U) = 4 (18) 1; s.n. (U, K) = 8 (1) 2; s.n. (U) = 8 (4).

HORST: 18 (B) = 4 (20).

HOSE: 170 (K) = 11 (1) 1; 279 (K) = 11 (1) 1; 797 (K) = 5 (2).

HOUTVESTER SUM. WESTKUST: 7 (B) = 4 (1) 13.

HUITEMA: 4 (B) = 9 (1).

IBOET: 99 (L) = 9 (1); 159 (L) = 1 (1); 205 (L, B, U) = 4 (16) 2; 261 (B) = 11 (1) 4; 263 (B) = 11 (1) 4; 311 (L) = 1 (1); 331 (B) = 4 (18) 1; 356 (B) = 4 (10) 1; 371 (L) = 11 (1) 2; 406 (L, B, K) = 4 (16) 2.

IDENBURG: 8 (B) = 9 (1); 37 (B) = 4 (10) 1; 39 (B) = 9 (1).

ISMAIL: 5 (B) = 9 (1); 22 (B) = 5 (1) 2; 31 (B) = 4 (18) 2.

JACOBSON: 23 (L) = 11 (1) 2; 269 (L, B) = 4 (1) 10; 331 (B) = 11 (1) 2; s.n. (B) = 4 (10) 1; s.n. (B) = 4 (17) 1; s.n. (B) = 9 (1).

JAHERI: 44 (B) = 4 (27); s.n. (B) = 4 (1) 6; s.n. (B) = 11 (1) 2.

JENSEN: 175 (B) = 4 (10); 350 (B, L) = 4 (10).

JESWIET: s.n. (B) = 4 (17) 2.

JOCHEMS: 3020 (B) = 10 (3).

DE JONG: 9 (B) = 9 (1).

JUNGHUHN: 50 (L) = 4 (1) 2; 52 (K) = 4 (17) 1; 52 (L) = 4 (17) 2; 52 (L) = 4 (17) 4; 53 (L, K) = 4 (1) 2; 303 (L) = 5 (1) 2; 315 (L, U) = 4 (17) 1; 318 (L) = 4 (17) 2; 322 (L) = 8 (3) 1; 325 (L) = 4 (10) 1; 328 (L) = 11 (1) 2; 329 (L) = 4 (10) 2; 334 (L) = 4 (18) 2; 330 (L) = 2 (1); 352 (L) = 3 (1) 2; 361 (L) = 4 (17) 2; 364 (L) = 4 (10) 2; 375 (L, U) = 2 (1); 382 (L) = 3 (1) 1; 388 (L) = 8 (1) 1; 389 (L, U) = 4 (9); 391 (L) = 8 (3) 1; s.n. (L) = 3 (1) 2; s.n. (L) = 3 (1) 3; s.n. (L, Br. M.) = 4 (1) 2; s.n. (L) = 4 (1) 3; s.n. (L) = 4 (17) 2; s.n. (L) = 4 (18) 1; s.n. (U) = 8 (1) 2; s.n. (L) = 8 (3) 1; s.n. (L) = 8 (4); s.n. (L) = 9 (1).

KAHAR: 2011 (L, B) = 4 (1) 6.

KALSHOVEN: XVII (B) = 4 (1) 4.

KARTA: 223 (L, B) = 4 (10) 2.

KAUDERN: 27 (L) = 11 (1) 3; 81 (L) = 8 (2); 82 (L) = 9 (1).

KAWAKAMI: s.n. (B) = 10 (7).

KJELLBERG: 120 (B) = 4 (32); 235 (B) = 4 (11); 354 (L) = 5 (2). 454a (B) = 4 (10) 3; 466 (B) = 8 (1) 2; 672 (L, B) = 4 (1) 6; 741 (B) = 4 (1) 6; 866 (B) = 11 (1) 2; 1320 (B) = 4 (10) 2; 1559 (B) = 11 (1) 2; 1603a (L) = 4 (1) 1; 1704 (L) = 4 (1) 1; 1821a (B) = 4 (1) 9; 2252 (B) = 5 (2); 2958 (L) = 4 (1) 1; s.n. (B) = 1 (1).

KLEINHOONTE: 1 (B) = 3 (1) 3; 596 (B) = 11 (1) 2.

KLOSS: 19223 (B) = 4 (29).

KNAAP: 21 (B) = 9 (1).

KOBUS: s.n. (L, B) = 4 (1) 2; s.n. (B) = 4 (17) 2; s.n. (B) = 9 (1); s.n. (B) = 11 (1) 2.

KOENS: 1 (B) = 9 (1); 33 (B) = 4 (10) 1; 42 (B) = 4 (18) 1; 45 (B) = 9 (1); 60 (B) = 4 (18) 1; 107 (B) = 5 (1) 1; 155 (B) = 5 (1) 1; 160 (B) = 4 (18) 1; 184 (B) = 9 (2); 207 (B) = 11 (1) 2; 220 (B) = 8 (3) 1; 230 (B) = 10 (3); 277 (B) = 5 (1) 1; 281 (B) = 4 (17) 1; 315 (B) = 4 (18) 1; 379 (B) = 4 (17) 1; 488 (B) = 5 (1) 1; s.n. (B) = 8 (1) 1.

KOOPAL): s.n. (B) = 2 (1).

KOOPER: 506b (B) = 8 (1) 1.

KOORDERS (the β behind the number has been omitted): 161 (B) = 9 (1); 245 (B) = 8 (1) 1; 253 (B) = 8 (2); 275 (L, B) = 4 (1) 2; 1896 (L) = 5 (1) 1; 2347 (B) = 11 (1) 2; 2620 (L) = 9 (1); 2765 (L) = 4 (1) 4; 2767 (L) = 4 (1) 2; 2768 (B) = 4 (1) 2; 2769 (L, B) = 4 (1) 2; 2770 (L, Br. M.) = 4 (1) 4; 2272 (L) = 4 (1) 4; 2774 (B) = 4 (1) 2; 2777 (B) = 4 (1) 2; 2778 (B) = 4 (1) 2; 2779 (B) = 4 (1) 2; 2780 (B) = 4 (1) 2; 2782 (B) = 4 (1) 1; 2783 (B) = 4 (1) 2; 2784 (B) = 4 (1) 2; 2785 (B) = 4 (1) 2; 2786 (B) = 4 (1) 2; 2787 (B) = 4 (1) 2; 2788 (B) = 4 (1) 2; 2789 (B) = 4 (1) 2; 2790 (B) = 4 (1) 2; 2792 (B) = 4 (1) 2; 2795 (B) = 4 (1) 2; 2797 (B) = 4 (1) 2; 2798 (B) = 4 (1) 2; 2799 (B) = 4 (1) 2; 2800 (L) = 4 (1) 3; 2802 (L) = 4 (1) 1; 2803 (L) = 4 (1) 2; 2804 (B) = 4 (1) 2; 2805 (B) = 4 (1) 2; 2806 (B) 4 (1) 3; 2807 (L) = 4 (1) 3; 2809 (B) = 4 (1) 4; 3777 (B) = 8 (3) 2; 9915 (B) = 4 (1) 2; 9979 (B) = 4 (1) 2; 10903 (B) = 4 (1) 2; 11177 (B) = 4 (1) 2; 11721 (B) = 4 (1) 2; 11862 (B) = 4 (1) 2; 12480 (L, B) = 4 (1) 3; 12481 (L, K) = 4 (1) 3; 12483 (L) = 4 (1) 3; 12601 (L) = 4 (1) 3; 13299 (B) = 4 (1) 2; 14401 (B) = 4 (1) 2; 14402 (U, L) = 4 (1) 2; 14403 (B) = 4 (1) 2; 14962 (B) = 8 (2); 15022 (L) = 10 (3); 15094 (L) = 9 (1); 15206 (L, B) = 4 (1) 2; 15245 (B) = 4 (10) 3; 155346 (L, B) = 4 (1) 2; 15347 (L, B) = 4 (1) 2; 15348 (L, B) = 4 (1) 2; 15437 (B) = 9 (1); 15660 (L, K, B) = 4 (1) 1; 16415 (B) = 8 (1) 1; 16417 (B) = 9 (1); 16418 (B) = 9 (1); 16419 (L) = 9 (1); 16420 (B) = 9 (1); 16435 (L) = 5 (2); 16436 (L) = 5 (2); 16437 (B) = 5 (1) 1; 16438 (L) = 5 (2); 16439 (L) = 5 (2); 16469 (L) = 4 (11); 16476 (L) = 11 (1) 3; 16478 (L) = 11 (1) 2; 16479 (L) = 11 (1) 3; 16480 (L) = 11 (1) 2; 16481 (L) = 11 (1) 2; 16494 (L) = 4 (10) 2; 16495 (L, B) = 4 (1) 6; 16496 (B) = 4 (11); 16497 (L, B) = 4 (24);

16499 (B) = 4 (11); 16500 (B) = 4 (24); 16501 (B) = 4 (10) 1; 16503 (B) = 4 (11); 16504 (L, B) = 4 (1) 6; 16506 (L, B) = 4 (24); 16507 (L) = 4 (1) 1; 16507 (L, B) = 4 (1) 6; 16508 (L) = 4 (1) 1; 16509 (L) = 4 (11); 16510 (L) = 4 (11); 16525 (B) = 4 (11); 19218 (L) = 4 (1) 1; 19218 (L, B) = 4 (1) 6; 19220 (L, B) = 4 (1) 6; 19878 (B) = 8 (3) 2; 19881 (B) = 4 (10) 3; 19925 (B) = 11 (1) 2; 20035 (L) = 4 (1) 1; 20113 (B) = 4 (1) 1; 20549 (L) = 4 (18) 1; 20550 (L) = 4 (18) 1; 20559 (B) = 11 (1) 2; 20564 (B) = 9 (1); 20565 (L) = 5 (1) 1; 20808 (B) = 4 (17) 2; 20836 (B) = 4 (10) 3; 20950 (B) = 4 (1) 2; 21375 (B) = 11 (1) 2; 21586 (B) = 4 (1) 6; 21398 (B) = 4 (1) 2; 22059 (B) = 11 (1) 2; 22212 (B) = 4 (17) 2; 22432 (B) = 4 (1) 2; 22432 (B) = 4 (1) 4; 22656 (L) = 4 (18) 2; 22823 (B) = 8 (1) 1; 22866 (B) = 4 (1) 2; 22872 (B) = 5 (1) 2; 22914 (B) = 4 (18) 2; 22920 (B) = 11 (1) 2; 22938 (L, B) = 8 (2); 22963 (L) = 9 (1); 23022 (B) = 4 (1) 2; 23044 (L, B, U) = 4 (1) 2; 23075 (B) = 8 (2); 23076 (B) = 9 (1); 23091 (L, B) = 4 (1) 4; 23175 (B) = 5 (1) 2; 23202 (B) = 11 (1) 2; 23224 (L) = 11 (1) 2; 23370 (B) = 4 (18) 1; 23583 (L) = 11 (1) 2; 23662 (B) = 4 (1) 2; 23831 (B) = 4 (1) 2; 23901 (L) = 4 (1) 4; 24437 (B) = 8 (1) 1; 24551 (L) = 4 (1) 1; 24926 (L) = 4 (18) 1; 25000 (B) = 4 (10) 2; 25073 (B) = 4 (18) 1; 25136 (B) = 5 (1) 2; 25215 (B) = 4 (18) 1; 25554 (L, B) = 4 (1) 4; 25674 (L, B) = 4 (1); 26064 (L) = 11 (1) 3; 26218 (B, L) = 4 (10) 2; 26224 (B) = 5 (1) 2; 26419 (B) = 10 (3); 26495 (B) = 9 (1); 26640 (L) = 4 (1) 2; 26650 (B) 4 (17) 1; 26716 (B) = 4 (1) 3; 26868 (L) = 4 (1) 1; 26869 (L) = 4 (1) 1; 27113 (L, B) = 4 (1) 2; 27116 (B) = 9 (1); 27251 (B) = 4 (18) 1; 27345 (L) = 4 (18) 1; 27677 (B) = 8 (2); 27691 (L) = 11 (1) 3; 27692 (L) = 9 (1); 28014 (L) = 5 (1) 2; 28228 (L) = 8 (1) 1; 28229 (B) = 4 (18) 3; 28466 (L) 5 (1) 1; 28502 (B) = 4 (17) 2; 28532 (L) = 4 (17) 2; 28535 (L) = 4 (17) 2; 28748 (B) = 4 (18) 2; 28750 (B) = 4 (18) 2; 29184 (B) = 4 (17) 2; 29186 (B) = 11 (1) 2; 29236 (B) = 5 (1) 2; 29798 (B, L) = 4 (1) 2; 29799 (L, B) = 4 (1) 2; 29897 (B) = 8 (2); 30328 (B) = 4 (1) 1; 30602 (B) = 4 (1) 2; 30854 (B) = 8 (1) 1; 30946 (B) = 4 (1) 2; 31145 (L) = 11 (1) 2; 31290 (L) = 8 (1) 1; 31291 (B) = 9 (1); 31298 (B) = 5 (1) 1; 31299 (L) = 4 (18) 1; 31323 (B) = 1 (1); 31449 (B) = 1 (1); 31464 (B) = 4 (10) 2; 31473 (L) = 4 (18) 1; 31476 (B) = 9 (1); 31616 (L) = 11 (1) 2; 31713 (L) = 9 (1); 31713 (L) = 9 (2); 31727 (B) = 10 (7); 31786 (B) = 10 (3); 31833 (B) = 4 (17) 1; 31851 (B) = 10 (3); 31887 (B) = 8 (3) 2; 31928 (L) = 8 (2); 32262 (B) = 11 (1) 3; 32398 (B) = 4 (1) 2; 32554 (B) = 4 (17) 2; 32614 (B) = 4 (10) 2; 32615 (L) = 9 (1); 32616 (B) = 5 (1) 2; 32617 (B) = 4 (18) 2; 32627 (L) = 1 (1); 32660 (B) = 4 (10) 2; 32663 (B) = 5 (1) 2; 32664 (B) = 4 (18) 2; 32671 (B) = 4 (1) 2; 32928 (B) = 4 (18) 2; 33047 (L,B) = 4 (1) 2; 33283 (B) = 10 (3); 33318 (B) = 10 (3); 33490 (B) = 8 (1) 1; 33491 (B) = 5 (1) 2; 33496 (B) = 9 (1); 33497 (B) = 4 (18) 2; 33500 (B) = 8 (1) 1; 33501 (B) = 5 (1) 2; 33838 (B) = 4 (1) 2; 33900 (B) = 4 (1) 2; 34190 (B) = 4 (1) 2; 34640 (L) = 8 (1) 1; 34647 (B) = 10 (3); 34649 (B) = 5 (1) 2; 34650 (B) = 9 (1); 34920 (B) = 5 (1) 2; 34928 (B) = 4 (18) 1; 34931 (B) = 9 (1); 35906 (B) = 9 (1); 35907 (B) = 5 (1) 2; 35919 (B) = 11 (1) 3; 36143 (B) = 4 (18) 3; 36144 (B, L) = 5 (1) 2; 36223 (L) = 11 (1) 2; 36654 (B) = 9 (1); 36660 (B) = 4 (1) 2;

36661 (B) = 4 (10) 1; 36665 (B) = 4 (10) 1; 36688 (B) = 9 (1); 36702 (B) = 10 (3); 36728 (B) = 4(10) 1; 36897 (L) = 11 (1) 2; 37128 (L) = 10 (3); 37395 (B) = 4 (17) 2; 37426 (B) = 4 (1) 2; 37427 (L, K) = 4 (17) 2; 37428 (B) = 4 (17) 2; 37770 (K) = 8 (3) 2; 37775 (L) = 11 (1) 2; 37967 (L) = 8 (3) 2; 38571 (B) = 4 (1) 2; 38833 (B) = 4 (1) 2; 39023 (L, B) = 4 (1) 2; 39280 (L, K, B, U) = 4 (1) 1; 40412 (B) = 4 (10) 1; 40508 (B) = 4 (10) 2; 40563 (B) = 11 (1) 2; 40579 (L) = 11 (1) 2; 40655 (B) = 4 (17) 1; 40667 (B) = 11 (1) 2; 40699 (L, B) = 8 (4); 40814 (B) = 8 (1) 1; 40875 (B) = 4 (10) 1; 40931 (B) = 10 (3); 41045 (B) = 8 (2); 41146 (B) = 4 (10) 2; 41149 (B) = 8 (1) 1; 41204 (B) = 9 (1); 41210 (B) = 4 (18) 1; 41338 (B) = 4 (10) 1; 41498 (L) = 4 (18) 2; 41683 (L) = 9 (1); 41703 (L) = 4 (10) 1; 41773 (B) = 4 (1) 2; 41815 (B) = 4 (1) 2; 41956 (B) = 4 (1) 2; 42028 (B) = 4 (1) 2; 420552 (L, K) = 10 (7); 42064 (L) = 10 (2); 42195 (B) = 10 (7); 43306 (L) = 9 (1); 43307 (B) = 9 (1); 43342 (L) = 11 (1) 3; 43353 (B) = 4 (17) 2; 43354 (L) = 4 (17) 2; 43355 (B) = 4 (17) 2; 43356 (L) = 4 (17) 2; 43359 (B) = 2 (1); 43637 (B) = 4 (17) 4; 43723 (B) = 2 (1); 43729 (B) = 2 (1); 43863 (L) = 2 (1); 43887 (B) = 9 (1); 43903 (L) = 4 (18) 2; 43933 (L) = 4 (20); 44004 (B) = 8 (1) 1; 44160 (L) = 9 (1); 44163 (B) = 11 (1) 2; 47985 (L) = 8 (2); 47986 (B) = 8 (2); 47987 (B) = 9 (1); 47988 (B) = 9 (1); 47992 (B) = 5 (1) 1; 47995 (B) = 10 (3); 48002 (B) = 4 (17) 1; 48003 (L) = 4 (18) 1.

KORNASSI: 88 (B) = 4 (12); 479 (B) = 4 (12); 553 (L) = 11 (1) 1; 592 (L) = 8 (4); 744 (L) = 11 (1) 1; 791 (B, U, L) = 4 (10) 2; 1365 (L) = 8 (1) 2; 1394 (B) = 9 (1); 1405 (L) = 11 (1) 1.

KORTHALS: 998 (L) = 4 (1) 5; s.n. (L) = 3 (1) 1; s.n. (L) = 4 (1) 2; s.n. (L) = 4 (1) 3; s.n. (L) = 4 (1) 6; s.n. (L) = 4 (1) 8; s.n. (L) = 4 (1) 9; s.n. (L) = 4 (10) 1; s.n. (L) = 4 (10) 2; s.n. (L) = 4 (17) 1; s.n. (L) = 4 (17) 2; s.n. (L) = 4 (18) 1; s.n. (L) = 8 (1) 1; s.n. (L) = 8 (1) 2; s.n. (L) = 8 (2); s.n. (L) = 8 (4); s.n. (L) = 11 (1) 2; s.n. (L) = 11 (1) 3.

KRAMER: 58 (B) = 9 (1); 106 (B) = 8 (2); 110 (B) = 10 (3); 143 (B) = 9 (1); 153 (B) = 4 (18) 1.

KRUKOFF: 318 (B) = 4 (1) 1.

KRUYFF: 21 (B) = 11 (1) 2; 52 (B) = 8 (1) 1; 64 (B) = 4 (11).

KUHL and VAN HASSELT: s.n. (L) = 11 (1) 2.

KUNTZE: 5512 (K) = 3 (1) 2.

KURZ: 497 (K) = 11 (1) 2.

LAM: 132 (B) = 9 (2); 203 (B) = 4 (17) 1; 220 (B) = 8 (1) 1; 272 (B) = 8 (3) 1; 310 J (B) = 10 (7); 339 (B) = 8 (3) 1; 2241 (L) = 8 (4); 2300 (B) = 7 (1); 2409 (B) = 11 (1) 2; 2414 (B) = 5 (2); 2420 (B) = 4 (11); 2461 (B) = 8 (1) 1; 2589 (B) = 4 (10) 1; 2604 (B) = 9 (1); 2630 (B) = 4 (12); 3088 (B) = 8 (1) 1; 3709 (B) = 4 (12); 3754 (B) = 11 (1) 2; 3774 (B) = 4 (27); 3783 (B) = 10 (7).

LANE POOLE: 429 (K) = 4 (1) 6.

LEEFMANS: 19 (B) = 8 (4); 80 (B) = 4 (10) 1; 92 (B) = 9 (1); 123 (B) = 4 (18) 2; 129 (B) = 9 (1); 131 (B) = 4 (18) 2; s.n. (B) = 4 (10) 2; s.n. (B) = 5 (1) 1; s.n. (B) = 5 (1) 2; s.n. (B) = 9 (2).

LEWANDOWSKY: s.n. (L) = 4 (18) 3.

LEWE: 36 (K) = 4 (1) 6.

LÖRZING: 30a (B) = 2 (1); 30 (B) = 4 (17) 2; 320 (B) = 8 (3) 3; 343 (B) = 9 (1); 356 (B) = 8 (2); 357 (B) = 4 (18) 1; 480 (B) = 4 (17) 2; 628 (B) = 11 (1) 2; 875 (B) = 9 (1); 990 (B) = 4 (10) 1; 1127 (B) = 10 (3); 1134 (B) = 9 (1); 1179 (B) = 10 (3); 1243 (B) = 8 (3) 1; 1256 (B) = 4 (17) 1; 1285 (B) = 8 (3) 2; 1298 (B) = 4 (17) 1; 1300 (B) = 8 (3) 1; 1307 (L, B) = 4 (1) 3; 1327 (L) = 4 (1) 2; 1360 (B) = 8 (4); 1482 (U) = 8 (1) 1; 1489 (U) = 10 (3); 1631 (B) = 8 (1) 1; 1840 (B) = 10 (2); 1931 (L) = 10 (7); 2408 (B) = 9 (2); 3019 (L, B) = 4 (10) 1; 3022 (B) = 9 (1); 3100 (B) = 4 (18) 1; 3126 (B) = 1 (1); 3261 (B) = 11 (1) 2; 3278 (B) = 4 (10) 1; 3311 (B) = 8 (2); 3415 (B) = 4 (10) 2; 3416 (B) = 9 (1); 3429 (B) = 1 (1); 3453 (B) = 1 (1); 3561 (B) = 9 (1); 3646 (B) = 4 (10) 1; 3717 (B) = 1 (1); 3723 (B) = 4 (10) 1; 3729 (B) = 4 (18) 1; 3740 (B) = 9 (1); 3775 (B) = 4 (18) 1; 3884 (B) = 4 (18) 1; 3891 (B) = 11 (1) 2; 3901 (B) = 4 (10) 1; 3903 (B) = 8 (2); 3987 (B) = 4 (18) 1; 4101 (B) = 5 (1) 2; 4126 (B) = 4 (1) 5; 4691 (L, B) = 8 (4); 4872 (B) = 4 (10) 3; 4876 (B) = 9 (1); 5404 (K, L) = 1 (1); 5833 (B) = 8 (1) 1; 5927 (L, U) = 4 (1) 2; 6173 (B) = 8 (2); 6237 (L) = 4 (10) 3; 6292 (B) = 9 (1); 6422 (B) = 5 (1) 2; 6473 (B) = 9 (1); 6491 (L) = 4 (10) 3; 6735 (B) = 8 (2); 7177 (B) = 9 (1); 7230 (B) = 4 (10) 3; 7395 (B) = 9 (1); 7545 (B) = 4 (10) 1; 7643 (B) = 5 (1) 1; 7659 (B) = 4 (18) 1; 7696 (B) = 9 (1); 7696 (B) = 11 (1) 2; 7785 (B) = 4 (10) 3, 8017 (L) = 4 (1) 1; 8048 (B) = 4 (18) 1; 8225 (B) = 8 (4); 8237 (B) = 9 (2); 8540 (B) = 8 (2); 8571 (B) = 4 (10) 3; 8580 (B) = 9 (1); 8805 (B) = 5 (1) 1; 8814 (B) = 4 (18) 1; 9041 (B) = 8 (2); 9254 (B) = 4 (10) 2; 9332 (B) = 4 (10) 3; 9382 (B) = 8 (2); 9621 (B) = 11 (1) 2; 9632 (B) = 4 (10) 2; 9721 (B) = 8 (1) 1; 9772 (B) = 9 (1); 9782 (B) = 4 (10) 6; 10771 (B) = 8 (2); 11076 (B) = 5 (1) 2; 11110 (B) = 9 (1); 11113 (B) = 4 (10) 1; 11114 (B) = 4 (18) 1; s.n. (B) = 9 (1).

MAHLMEISTER: 19 (B) = 4 (10) 2.

MAIER: 86 (L) = 11 (1) 3; 93 (L) = 4 (18) 2.

BUR. SCI. MANILLA: 783 (L) = 5 (2).

MATTHEW: s.n. (K) = 5 (1) 1; s.n. (K) = 8 (4).

VAN DER MEER MOHR: s.n. (B) = 4 (17) 2.

METSELAAR: s.n. (B) = 5 (1) 2.

MOH. DACHLAN: 16b (B) = 4 (1) 6.

DE MOL: 144 (B) = 5 (1) 2.

DE MONCHY: 49 (B) = 9 (1); 74 (B) = 11 (1) 3; s.n. (B) = 8 (1) 1; s.n. (B) = 8 (4); s.n. (B) = 9 (1).

MONDI: 198 (L, B) = 4 (10) 1; 202 (L, B) = 4 (1) 6.

MONTÉRIE. 29 (L, B, K) = 4 (1) 3.

MOSELY: s.n. (K) = 5 (1) 2; s.n. (Br. M.) = 8 (1) 1.

MOTLEY: 68 (K) = 4 (1) 6; 291 (B) = 4 (10) 2; 294 (K) = 9 (1); 309 (K) = 11 (1) 2; 312 (K) = 4 (18) 1; 364 (K) = 8 (1) 1; 385 (K) = 4 (1) 6; s.n. (K) = 5 (1) 2.

MOULTON: 6675 (K) = 4 (6).

MOUSSET: 73 (B) = 5 (1) 1; 201 (B) = 4 (18) 2; 227 (B) = 4 (1) 2; 399 (B) = 11 (1) 2; 527a (B) = 4 (10) 2; 855 (L) = 4 (17) 2; s.n. (Br. M.) = 4 (17) 2.

NATIVE COLL.: 306 (L) = 11 (1) 2; 728 (Br. M.) = 4 (1) 6; 7218 (K) = 11 (1) 2; s.n. (L) = 8 (2).

VAN OORT: s.n. (L) = 4 (17) 2.

VAN OOSTEN: 7 (B) = 11 (1) 2; s.n. (B) = 4 (17) 4.

OTTOLANDER: 248 (B) = 9 (1); 325 (B) = 5 (1) 1; 350 (B) = 4 (17) 2; 388 (B) = 4 (10) 1.

OUWEHAND: 10 (B) = 9 (1); 42 (B) = 4 (10) 1; 104 (B) = 8 (2); 137 (B) = 4 (18) 1; 267 (B) = 4 (18) 1; 316 (B) = 8 (1) 1.

VAN DER PAARDT: 78 (B) = 4 (18) 2.

PASCUAL: 2380 (B) = 4 (1) 6.

PEEKEL: 85 (L) = 4 (18) 3.

PIEPERS: s.n. (B) = 4 (10) 2; s.n. (B) = 4 (18) 1.

PLOEM: s.n. (L) = 4 (1) 2; s.n. (L) = 8 (4); s.n. (L) = 11 (1) 2.

POSTHUMUS: 459 (L, B) = 9 (1); 509 (B) = 4 (10) 1; 553 (L, B) = 4 (18) 1; 671 (B) = 4 (18) 1; 774 (B) = 1 (1); 805 (L, B) = 5 (1) 1; 880 (B) = 4 (18) 1; 1060 (U, B) = 4 (1) 6; 1078 (L, U, B, K) = 4 (18) 1; 2034 (B) = 9 (1); 3018 (B) = 4 (20); 3098 (B) = 4 (20); 3456 (B) = 4 (10) 3.

PRAETORIUS: s.n. (L) = 4 (1) 6; s.n. (L, K) = 4 (19).

PARAVICINI: s.n. (B) = 9 (1).

PRINGO ATMODJO: 302 (B) = 9 (1).

PULLE: 2661 (U) = 4 (17) 1; 3118 (U) = 9 (1); 4056 (U) = 8 (1) 1.

VAN DER PIJL: 104a (B) = 2 (1); 291 (B) = 4 (17) 1; 339 (B) = 8 (4).

RAAP: 8 (L) = 9 (1); 8 (L) = 11 (1) 2; 25 (L) = 4 (10) 2; 49 (B) = 8 (1) 1; 74 (L) = 10 (3); 142 (B) = 9 (1); 150 (L) = 9 (2); 175 (L) = 11 (1) 2; 294 (L) = 8 (1) 1; 320 (B) = 10 (3); 331 (L) = 1 (1); 401 (B) = 8 (1) 1; 440 (B) = 8 (1) 1; 443 (L) = 10 (3); 455 (B) = 8 (1) 1; 560 (L) = 11 (1) 1; 566 (L) = 4 (18) 2; 603 (L) = 11 (1) 2; 660 (L) = 4 (17) 1; 661 (L) = 8 (4); 852 (L) = 4 (18) 1; 2424 (L) = 5 (1) 1.

RACHMAD: 956 (B) = 4 (11).

RAMOS: 1338 (B) = 1 (1); 1823 (B) = 5 (1) 1; 1823 (L) = 5 (1) 3.

RANT: 3 (B) = 9 (2); 189 (B) = 4 (18) 1; 263 (B) = 1 (1); 476 (B) = 4 (11); 624 (B) = 4 (10) 1; 791 (B) = 4 (10) 4; 793 (B) = 4 (10) 1; 851 (B) = 8 (1) 1; 1922 (L) = 2 (1); s.n. (L) = 2 (1); s.n. (B) = 4 (1) 2; s.n. (B) = 4 (17) 2; s.n. (L) = 8 (2).

RAYNAUD: s.n. (L) = 4 (18) 1; s.n. (L) = 5 (1) 1.

REINWARDT: 1289 (L) = 4 (19); 1591 (L) = 2 (1); s.n. (L) = 4 (1) 2; s.n. (L) = 4 (10) 2; s.n. (L) = 4 (24); s.n. (L) = 9 (1); s.n. (L) = 10 (1); s.n. (L) = 11 (1)2.

RENSCH: 51 (B) = 9 (1); 86 (B) = 8 (2); 256 (B) = 9 (1); 388 (B) = 4 (19); 481 (B) = 9 (1); 621 (B) = 11 (1) 2; 829 (B) = 4 (20); 887 (B) = 5 (1) 1; 978 (B) = 4 (20); 1030 (B) = 5 (1) 2; 1032 (B) = 8 (1) 1; 1064 (B) = 4 (25); 1208 (B) = 4 (20); 1298 (B) = 8 (2); 1500 (B) = 8 (4); s.n. (B) = 4 (31).

BENWARIN: 2287 (L, K) = 4 (2).

RICHARDS: 1618 (K) = 4 (7); 1734 (K) = 4 (1) 12; 1954 (K) = 4 (1) 2.

RIDLEY: 12362 (K) = 4 (10) 1; s.n. (K, Br. B.) = 4 (1) 2; s.n. (K) = 4 (10) 3; s.n. (K) = 8 (4); s.n. (K) = 10 (3).

RIEDEL: s.n. (K) = 4 (10) 2; s.n. (K) = 4 (18) 3; s.n. (K) = 4 (26); s.n. (K) = 4 (32); s.n. (K) = 8 (1) 1; s.n. (K) = 9 (1).

ROBINSON: 426 (K, L) = 4 (10) 2; 427 (L, B, K) = 8 (1) 1; 428 (L, K) = 9 (1), 1834 (L, K) = 4 (12); 1838 (L, K) = 11 (1) 2; 1842 (B, L) = 5 (1) 2; 1843 (L, K) = 1 (1); 1844 (L, K) = 10 (3); 2522 (B) = 5 (1) 2; 2526 (L) = 4 (14).

ROBINSON and KLOSS: 45 (Br. M.) = 4 (1) 6; 119 (Br. M.) = 9 (1); 2450 (K, Br. M.) = 4 (18) 1; s.n. (Br. M.) = 4 (1) 2; s.n. (K) = 4 (18) 1; s.n. (Br. M.) = 4(28); s.n. (K, Br. M.) = 8 (4); s.n. (K) = 9 (1); s.n. (K) = 11 (1) 2.

ROELOFSEN: 12 (B) = 5 (1) 2; 6250 (B) = 10 (3); 6288 (B) = 4 (1) 2

VAN RÖMER: s.n. (B) = 4 (10) 1; s.n. (B) = 9 (1).

RUTTEN: 128 (B) = 4 (12), 237 (B) = 11 (1) 1; 310 (L) = 11 (1) 1; 505 (L) = 9 (1); 761 (L) = 9 (1); 970 (L) = 8 (1) 2; 1584 (B) = 4 (12); 1584a (B) = 9 (1); 1638 (L) = 4 (12); 1642 (L) = 11 (1) 1; 1998 (L, B) = 8 (1) 3; 2101 (L) = 4 (27); 2212 (L, B) = 10 (6).

RUTTNER: 45 (B) = 4 (10) 6

VAN RIJCKEVORSEL: s.n (B) = 10 (3).

SAIMOENDI: 23 (L, B) = 4 (1) 2.

SAPIIN: 209 (U) = 4 (1) 3; 230 (L) = 10 (2); 511 (B) = 8 (4); 2567 (U, B) = 4 (17) 1; s.n. (B) = 10 (3); s.n. (L, B) = 10 (7).

DE LA SAVINIERRE: 153 (K) = 4 (11); 285 (K) = 11 (1) 1.

SCHEFFER: s.n (B) = 4 (18) 1; s.n (B) = 11 (1) 2.

SCHIMPER: s.n. (L) = 4 (17) 2.

SIHAJA: s.n. (B) = 8 (2); s.n. (B) = 9 (1).

VAN SLOOTEN: 9 (B) = 8 (3) 1; 27 (B) = 10 (7); 303 (L) = 3 (1) 2; 695 (B) = 11 (1) 2; 739 (B) = 10 (8); 2015 (B) = 4 (10) 2; 2138 (B) = 8 (1) 1; 2391 (B) = 4 (18) 2; 2480 (B) = 11 (1) 2.

SMITH: 639 (B) = 9 (2); s.n. (B) = 11 (1) 2.

SMITH and RANT: 179 (L) = 3 (1) 2; 517 (B) = 11 (1) 2; 548 (B) = 4 (17). 1

SOEGANDIREDJA: 28 (B) = 8 (1) 1; 55 (K, B) = 10 (3); 93 (B) = 9 (1); 117 (B) = 4 (18) 2; 118 (B) = 4 (18) 2; 191 (L) = 8 (2); 206 (B) = 11 (1) 3; 257 (B) = 4 (17) 1; 307 (L) = 11 (1) 3; s.n. (B) = 4 (10) 2.

SPANOGHE: s.n. (L) = 8 (1) 1.

SPEC. BLANCOANAE: 235 (L) = 4 (19) 3.

SPRÉE: s.n. (L) = 9 (1).

SPRUIT: s.n. (B) = 10 (8).

VAN STEENIS: 80 (B) = 9 (1); 334 (B) = 11 (1) 4; 420 (B) = 8 (1) 1; 771 (L, B) = 9 (1); 1026 (L) = 1 (1); 1042 (B) = 9 (1); 1071 (B) = 5 (1) 2; 1095 (B) = 4 (1) 2; 1583 (B) = 1 (1); 1697 (B) = 4 (18) 1; 1801 (B) = 9 (2); 1804 (B) = 6 (1); 1810 (B) = 10 (7); 1820 (B) = 10 (2); 1863 (B) = 4 (17) 1; 1869 (B) = 8 (3) 1; 2546 (B) = 4 (1) 2;

3279 (B) = 8 (2); 3747 (B) = 11 (1) 4; 4006 (B) = 4 (1) 2; 4334 (B) = 8 (3) 2; 4368 (L, K) = 3 (1) 1; 4398 (L) = 3 (1) 1; 4427 (L) = 3 (1) 1; 4437 (B) = 4 (18) 1; 4448 (B) = 4 (17) 1; 4478 (B) = 4 (10) 2; 4513 (B) = 4 (17) 2; 4555 (L) = 4 (17) 2; 4751 (B) = (18) 1; 4874 (B) = 3 (1) 1; 5159 (B) = 4 (1) 3; 5177 (B) = 10 (7); 5374 (B) = 1 (1); 5468 (B) = 4 (17) 1; 5951 (B) = 8 (4); 6152 (B) = 4 (18) 1.

STEUP: 53 (B) = 4 (10) 1; 54 (L) = 5 (2).

STOUTJESDIJK: 3 (B) = 9 (1); 60 (B) = 5 (1) 2.

VAN STRAELEN: 37 (B) = 8 (1) 1.

STRAUB: G. 1 (B) = 9 (1).

STRESEMANN: 293 (L) = 10 (6); 375 (L) = 10 (6).

SZEMIAN: 8 (B) = 9 (1); 31 (L, B) = 9 (1).

TENGWALL: 23 (L, B) = 9 (1); 33 (L, B, K) = 4 (13).

TEYSMANN: 98 (L) = 4 (1) 2; 1040 (B, U) = 4 (1) 8; 1042 (B) = 5 (1) 2; 1048 (U) = 4 (1) 2; 1739 (B) = 4 (9); 1739 (B) = 4 (20); 3526 (U) = 4 (1) 2; 5112 (U, B) = 4 (3); 5655 (B) = 4 (18) 2; 8302 (B) = 11 (1) 2; 8304 (B) = 8 (1) 1; 8305 (B) = 4 (1) 6; 8307 (B) = 8 (1) 1; 8780 (L) = 4 (19); 8781 (L, B, K) = 4 (16) 1; 8822 (B) = 4 (10) 2; 11933 (B) = 11 (1) 2; 12107 (B) = 11 (1) 2; 12589 (B) = 4 (11); 13693 (B) = 11 (1) 2; 13878 (B) = 4 (20); 13880 (L) = 4 (20); 14041 (B) = 4 (1) 9; 14082 (B) = 11 (1) 2; 14083 (B) = 8 (4); 14127 (B) = 11 (1) 2; 21298 (B) = 11 (1) 2; s.n. (B) = 3 (1) 3; s.n. (U, B, L) = 4 (1) 2; s.n. (B) = 4 (17) 2; s.n. (U, K, B) = 4 (17) 3; s.n. (B) = 4 (18) 1; s.n. (L, B) = 4 (20); s.n. (B) = 5 (1) 1; s.n. (B) = 8 (1) 1.

THORENAAR: 8 (B) = 9 (1); 173 (B) = 11 (1) 2.

TOXOPEUS: 113 (L) = 8 (4); 190 (L) = 4 (12); 196 (L) = 11 (1) 2; 525 (B) = 4 (10) 1.

TREUB: s.n. (B) = 11 (1) 2; s.n. (B) = 4 (10) 2; s.n. (B) = 4 (12).

UITTÉE: 13 (B) = 4 (10) 2; 26 (B) = 11 (1) 4; s.n. (B) = 4 (1) 2: s.n. (B) = 4 (10) 1; s.n. (B) = 5 (1) 2; s.n. (B) = 8 (1) 1; s.n. (B) = 9 (1).

VALETON: 8 (B) = 8 (2); s.n. (B) = 4 (10) 2; s.n. (B) = 4 (17) 1; s.n. (B) = 4 (18) 1; s.n. (L, B) = 10 (7); s.n. (B) = 11 (1) 2.

VAN DER VECHT: 15 (B) = 4 (10) 2.

VAN DER VEEN: s.n. (L) = 4 (10) 2; s.n. (L) = 4 (17) 1; s.n. (L) = 5 (1) 1; s.n. (L) = 9 (1); s.n. (L) = 10 (3).

VERHOEF: 20 (B) = 9 (1).

VERMEULEN: 5 (B) = 4 (14).

DE VISSER SMITS: s.n. (B) = 8 (1) 1; s.n. (B) = 8 (2); s.n. (B) = 9 (2).

DE VOGEL: 1915 (B) = 1 (1); s.n. (L) = 4 (10) 1.

DE VOOGD: 29 (B) = 8 (1) 2; 50 (L, B) = 4 (1) 10; 170 (B) = 8 (4); 404 (B) = 4 (10) 1; 533 (B) = 8 (2); 1542 (L) = 8 (4); 15422 (B) = 4 (1) 2; s.n. (B) = 5 (1) 1.

VORDERMAN: 150 (B) = 4 (18) 2; 2772 (B) = 4 (18) 1; s.n. (B) = 4 (10) 2; s.n. (B) = 4 (18) 1; s.n. (B) = 5 (1) 2; s.n. (B) = 8 (1) 1; s.n. (B) = 11 (1) 2.

DE VRIES: 39 (B) = 1 (1).

DE VRIESE and TEYSMANN: s.n. (L) = 4 (1) 2; s.n. (L) = 4 (3); s.n. (L) = 4 (1) 4.

VAN VUUREN: 12 (L) = 4 (18) 1; 201 (B) = 4 (18) 1; 292 (L) = 11 (1) 3; 377 (B) = 4 (18) 1; s.n. (B) = 4 (17) 1; s.n. (B) = 9 (2).

WAITZ: s.n. (L) = 2 (1); s.n. (L) = 3 (1) 2; s.n. (L) = 4 (17) 1; s.n. (L) = 9 (1); s.n. (L) = 11 (1) 2.

WALLACE: s.n. (K) = 4 (10) 2.

WALSH: 38 (B) = 4 (10) 7; 101 (B) = 5 (1) 2; 310 (B) = 2 (2); 328 (B) = 4 (33); 331 (B) = 4 (20); 332 (B) = 5 (1) 1; 409 (B) = 4 (34); 481 (B) = 4 (9); s.n. (B) = 5 (1) 2.

WEBB: s.n. (K) = 5 (1) 2; s.n. (K) = 8 (1) 1.

WEBER: s.n. (L) = 4 (10) 1; s.n. (L) = 4 (20).

WEDA: 2985 (B) = 4 (18) 2.

WEEHUIZEN: 1 (B) = 6 (1); 2 (B) = 1 (1).

WEINLAND: s.n. (B) = 4 (18) 3.

VAN WELSEM: 6 (B) = 11 (1) 2; 7 (B) = 4 (17) 1.

WENT: s.n. (L) = 3 (1) 3; s.n. (L) = 4 (17) 2; s.n. (U) = 9 (1).

WINCKEL: 82 (B) = 4 (17) 4; 616 (B) = 4 (10) 2; 764 (B) = 10 (3), 1160 (B) = 4 (1) 2; 1165 (B) = 5 (1) 1; 1221 (B) = 9 (1); 1400 (L) = 11 (1) 2; 1437 (L) = 8 (2); 1475 (B) = 4 (17) 1; 1541 (L, B) = 5 (1) 1; 1865 (L) = 9 (1); 1975 (B) = 4 (18) 1; s.n. (L) = 4 (10) 2.

WIND: 9831 (B) = 4 (10) 6.

WINTERSBOTTOM: s.n. (K) = 4 (18) 1; s.n. (K) = 5 (1) 1.

WIRIOSAPOETRO: 41 (L) = 4 (17) 2.

WISSE: 29 (B) = 5 (2); 68 (B) = 9 (2); 157 (B) = 4 (10) 1; 236 (B) = 4 (18) 2; 267 (B) = 11 (1) 2; 281 (B) = 10 (3); 326 (B) = 9 (1); 543 (B) = 8 (3) 2; 548 (B) = 10 (3); 560 (B) = 4 (17) 2; 624 (B) = 9 (2); 734 (B) = 4 (17) 2; 861 (B) = 4 (18) 1; s.n (B) = 4 (18) 2.

WOLFF VON WULFING: W 38 (B) = 4 (10) 2

WURTH: s.n. (B) = 2 (1).

YATES: 972 (B) = 11 (1) 2; 978 (B) = 4 (1) 1; 1090 (B) = 1 (1); 1294 (L, B) = 4 (1) 5; 1854 (B) = 4 (1) 5; 2115 (L, B) = 4 (1) 5; 2425 (L) = 8 (4); 2478 (B) = 10 (3).

ZEANO: 2360 (K) = 9 (1).

ZEYLSTRA: 3 (B) = 4 (17) 1.

ZIPPELIUS: 244 (L) = 4 (10) 4; s.n. (L) = 4 (10) 1; s.n. (L) = 4 (20); s.n. (L) = 4 (27).

ZOLLINGER: 6 (L, K, Br. M.) = 4 (18) 1; 7 (L, K) = 5 (1) 2; 18 (L) = 4 (19); 23 (L) = 9 (1); 24 (L, K) = 4 (10) 2; 222 (B, K) = 8 (1) 1; 417 (K, L) = 11 (1) 2· 606 (B) = 4 (1) 2; 792 (K, L) = 8 (1) 1; 792 (B) = 8 (2); 792 (B) = 8 (3) 1; 792 (B) = 8 (4); 1039 (L, K) = 4 (1) 2; 1039 (K) = 4 (1) 4; 1096 (Br. M.) = 4 (17) 1; 1486? (L) = 4 (17) 4; 1783 (L) = 8 (1) 1; 2171 (Br. M.) = 4 (17) 2; 2403 = 4 (22), 4 (23); 2634 (B) = 4 (1) 2; 2673 (Br. M.) = 4 (18) 1; 2704 (Br. M.) = 4 (10) 1; 2705 = 4 (22); 2762 (B) = 4 (20); 2772 (Br. M., U) = 4 (10) 1; 2830 (Br. M.) = 2 (1); 3173 (L, Br. M.) = 2 (1); 3220 (L) = 8 (1) 1; s.n. (U) = 4 (9); s.n. (L) = 4 (10) 2; s.n. (L) = 4 (17) 2; s.n. (L) = 4 (18) 1; s.n. (U) = 4 (31); s.n. (U) = 8 (1) 1; s.n. (L) = 8 (4); s.n. (L) = 10 (1).

ZWAARDEMAKER: 8 (B) = 9 (1); 53 (B) = 10 (3).

Key to the symbols of the genera, species, varieties and forms.

BLUMEA

TIJDSCHRIFT VOOR DE SYSTEMATIEK EN DE GEOGRAFIE DER PLANTEN

(A JOURNAL OF PLANT-TAXONOMY AND PLANT-GEOGRAPHY)

UITGEGEVEN DOOR HET RIJKSHERBARIUM TE LEIDEN
(PUBLISHED BY THE RIJKSHERBARIUM, LEIDEN, HOLLAND)

VOL. II, 1935—1937

N. V. BOEK- EN STEENDRUKKERIJ EDUARD IJDO — LEIDEN

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R e d a c t e u r:
De directeur van het Rijksherbarium, Nonnensteeg 1, Leiden.

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INHOUD — CONTENTS.

INDEX
to Vol. II
compiled by
J. J. SMITH
(Synonyms in italics)

BLUMEA

Vol. II, No. 1, blz. 1—23 2. IX. 1935

Uitgegeven door het / Published by the Rijksherbarium, Leiden, Nederland.

PLANT-MAPS FOR THE NETHERLANDS 1:3.000.000.
Part I.

Compiled by „The Institute for the Investigation of the Vegetation in the Netherlands" (I. V. O. N.).

Introduction.

This publication is a continuation of „Plantenkaartjes voor Nederland", published by Dr. J. W. C. Goethart and Dr. W. J. Jongmans in the years 1902—1908. For both publications the same methods, differing in two respects from those usually adopted elsewhere, have been employed.

As in the first place it is utterly impossible to show on a very small-scale map, the exact spot where a certain species of plant is to be found, this mock-accuracy has been avoided. Only that part of the topographical map is indicated, which contains the finding-place. With this end in view, each of the 64 sheets of the survey-map of the Netherlands is covered by a net of 48 rectangles, each side being approximately one hour's walk long (exactly 4180 × 5000 metres). These rectangles are called „hour-squares", each being subdivided into 16 „quarter-hour-squares" of 1045 × 1250 metres. The „hour-square", in which any special finding-place of a plant occurs, is clearly shown on a photo-lithographically reduced map with the „hour-square" division. As the scale of the reduced map is left large enough, even the „quarter-hour-square" in question can be clearly distinguished within its „hour-square".

A second item of interest is, that from each „quarter-hour-square" as complete an inventory as possible has been drawn up of all phanerogams and vascular cryptogams. From the result of these investigations separate maps have been compiled, showing the distribution of each kind of plant, both of the common and the rarer species, and showing the „squares" in which they are located. The maps formerly published by Goethart and Jongmans, scale 1:1.500.000 were just large enough to show the „quarter-hour-squares".

Since the „Institute for the Investigation of the Vegetation in the Netherlands" took over Goethart's and Jongmans' mapping in 1930, the compiling and inventarising has been done as follows. Each sheet of the survey-map is provided with an album of sketch-maps to a scale of

1:200.000. In this album each plant has its own map, on which every „quarter-hour-square" where the plant has been found is marked down. About one half of the 26.000 squares into which the map of the Netherlands has been divided, are more or less inventarised together with a few parts of Belgium and Germany, bordering on the Netherlands. All these data can be found in the 55 albums, covering together the whole of the Netherlands. In the „Rijksherbarium" (National Herbarium) at Leyden, where the albums are open to inspection, it is possible to trace at a glance, the distribution in any part of the country, of any special plant in which the investigator is interested.

Extracts, provided only with „hour-square" divisions, have been made from these maps, on a scale of 1:1.500.000. A reference to these extracts can therefore mean: „plant found in 1 quarter-hour-square" but also: „plant found in 16 quarter-hour-squares". Both extremes occur. More precise data are, however, to be found in the larger cartography, which is regularly kept up to date. The extracts are now completed for all phanerogams and vascular cryptogams found in the Netherlands, up till and including the end of the year 1934, while previous data are included wherever possible, as well as notes concerning the absence of any special species.

The present edition now presents a reduced reproduction (1:3.000.000) of some of these extracts. As a first group we have chosen a number of plants which are mentioned in literature as „Atlantic". In the Netherlands these show, apparently, a greatly varied distribution. If financially possible, one or more numbers will appear annually. They are obtainable on application, printed on one side only, in order to facilitate arrangement in any desired order, after being cut out. Should a subscriber require a map, that has not yet appeared, our secretary will be pleased to furnish this in manuscript-form. All detailed data are to be found in the 55 albums 1:200.000 in the National Herbarium at Leyden.

Our sincere thanks are due to the „Topografische Dienst" (Government Topographical Service) for its helpful cooperation.

The committee of the „Institute for the Investigation of the vegetation in the Netherlands" (I. V. O. N.):

Ir. A. W. Kloos (chairman).
Dr. J. W. C. Goethart.
Prof. Dr. J. Jeswiet.
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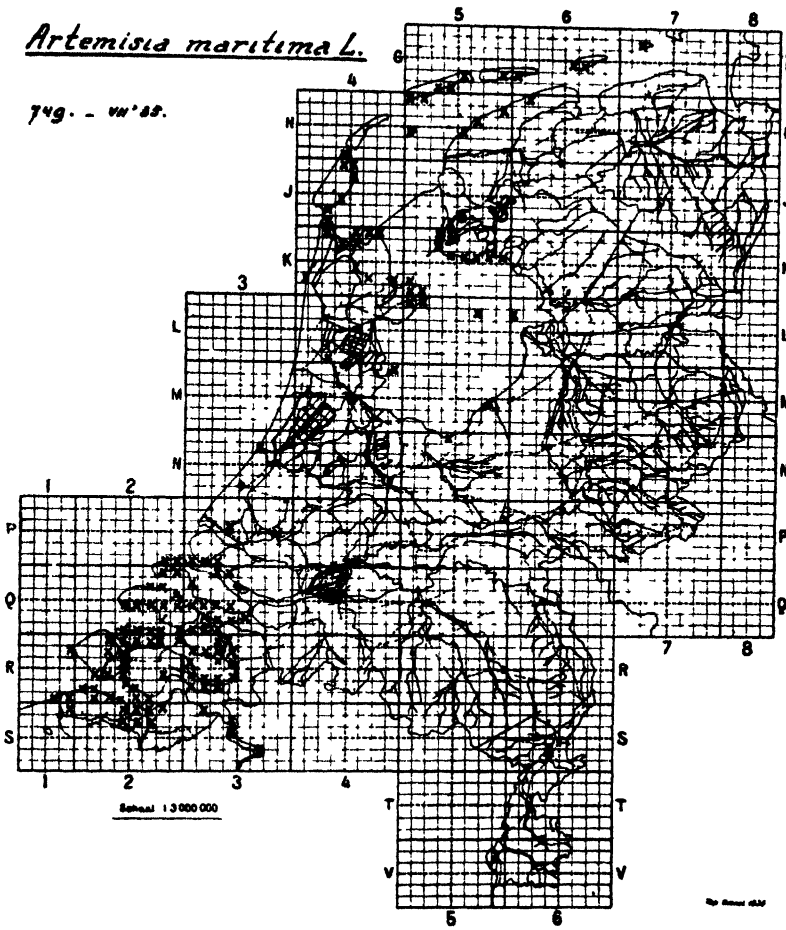
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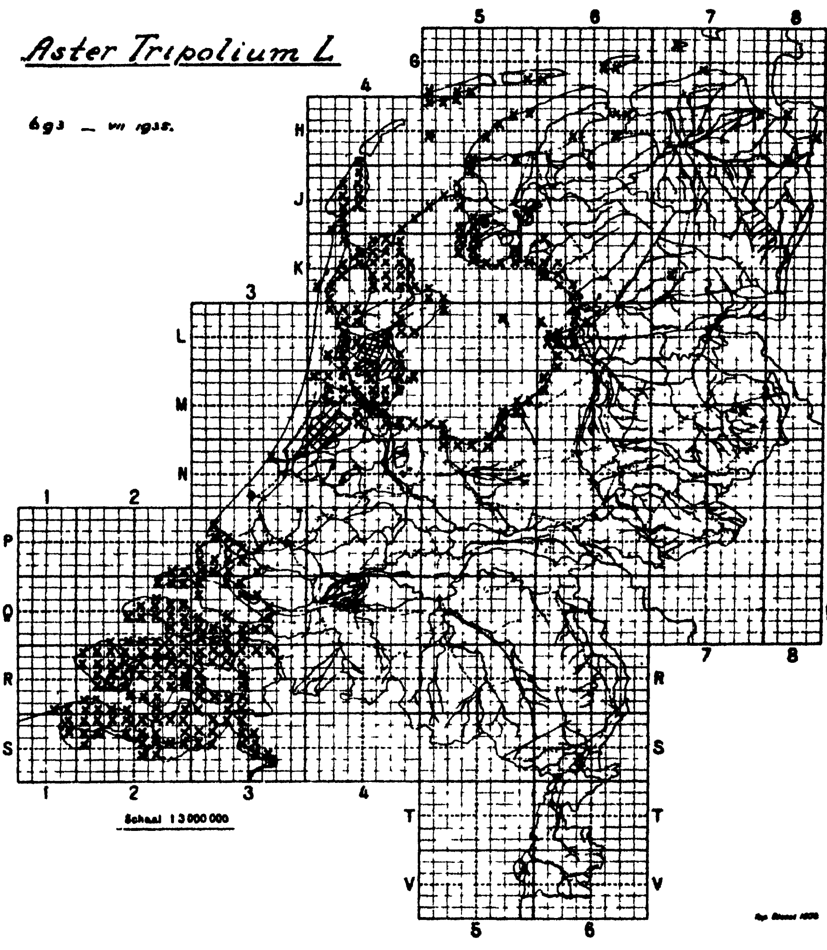

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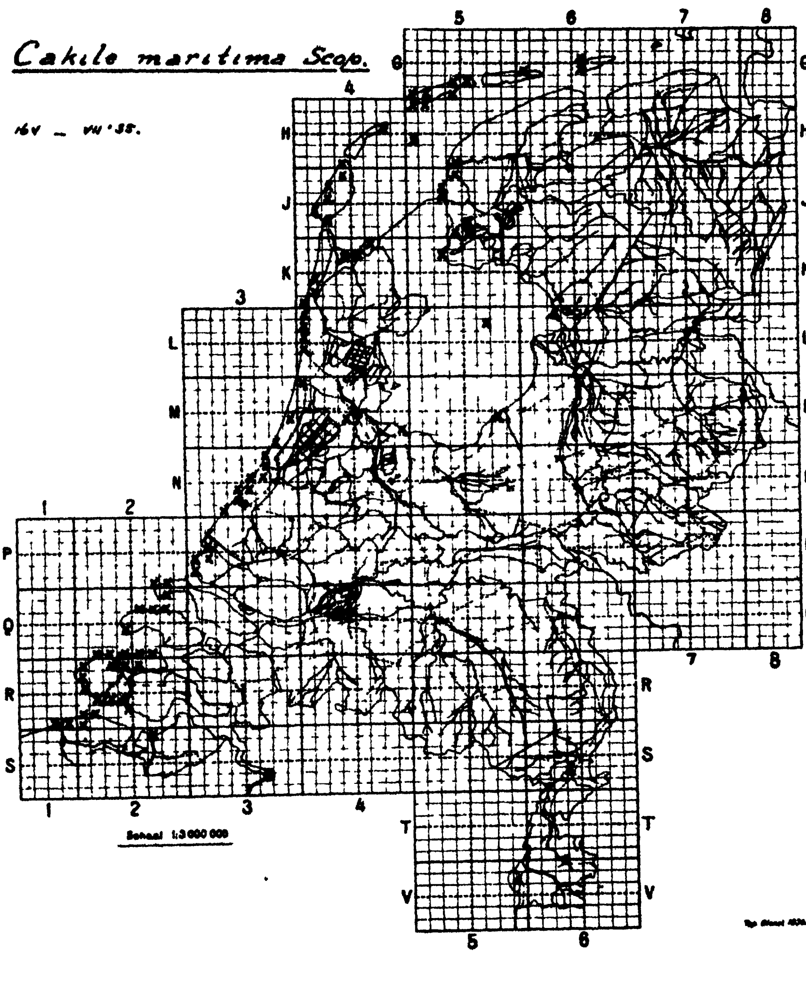
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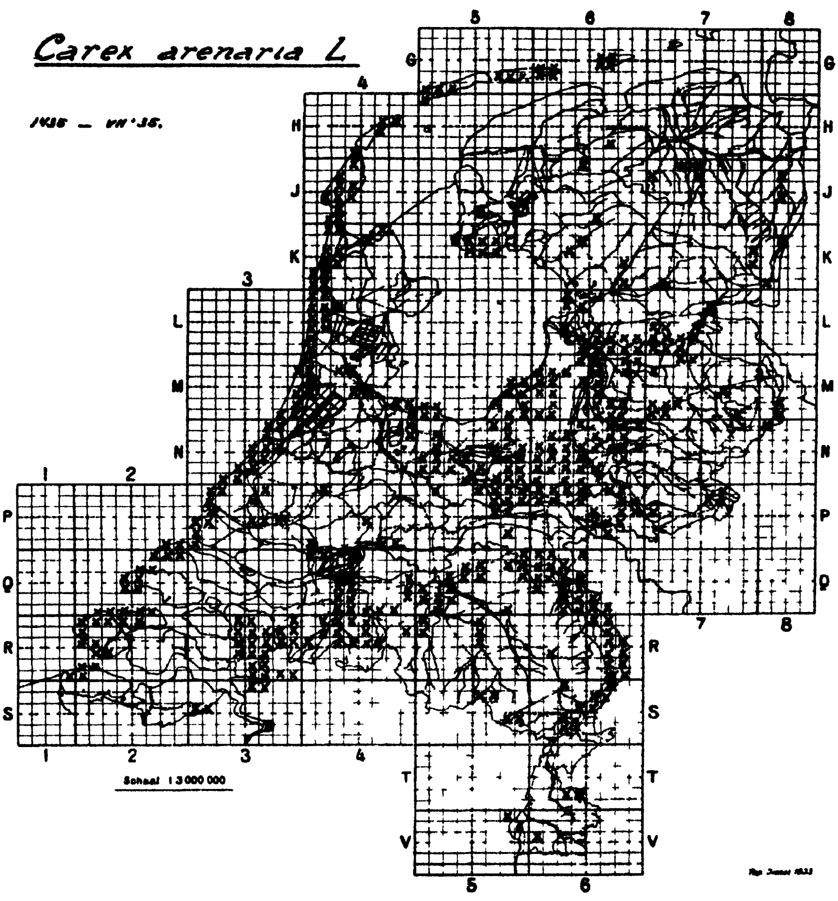
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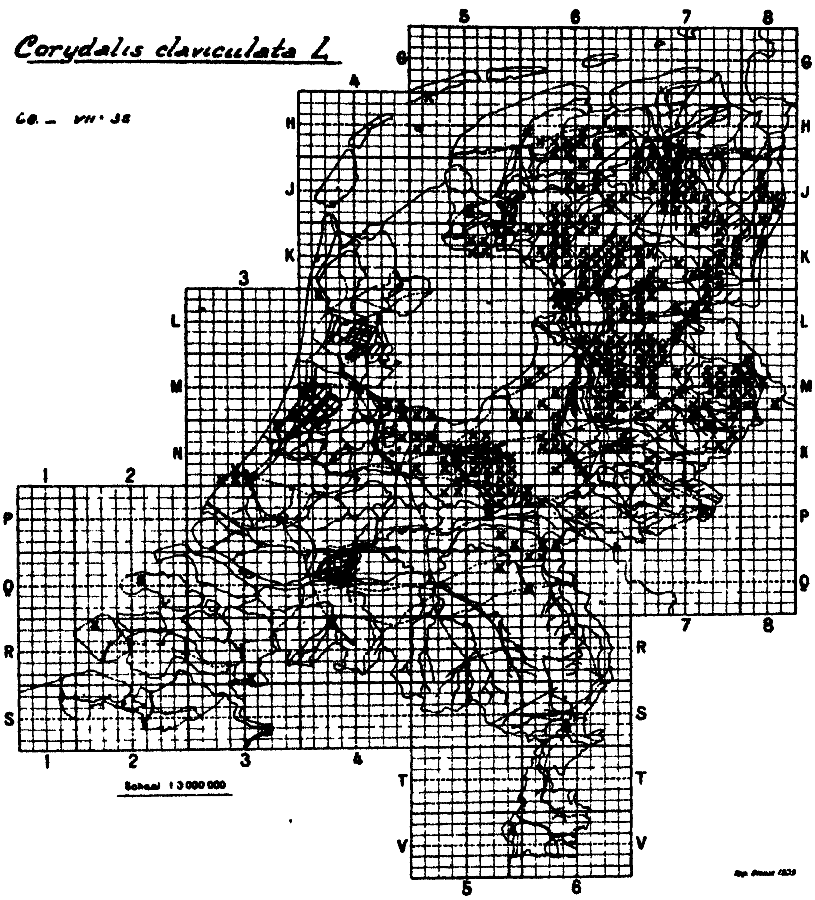
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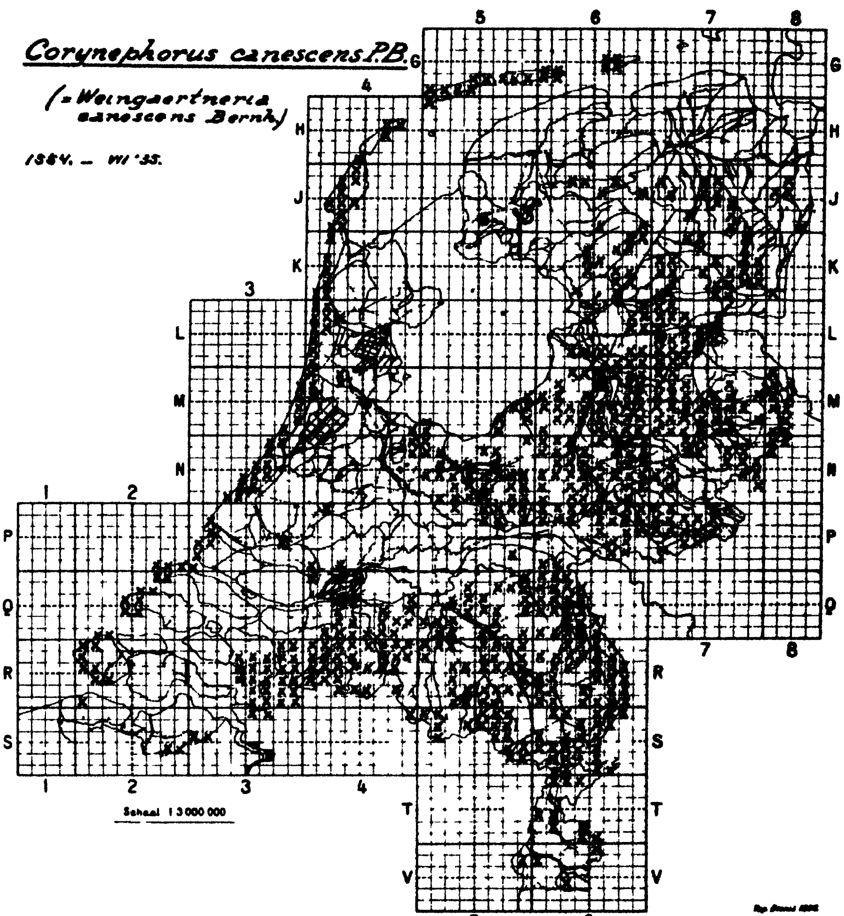
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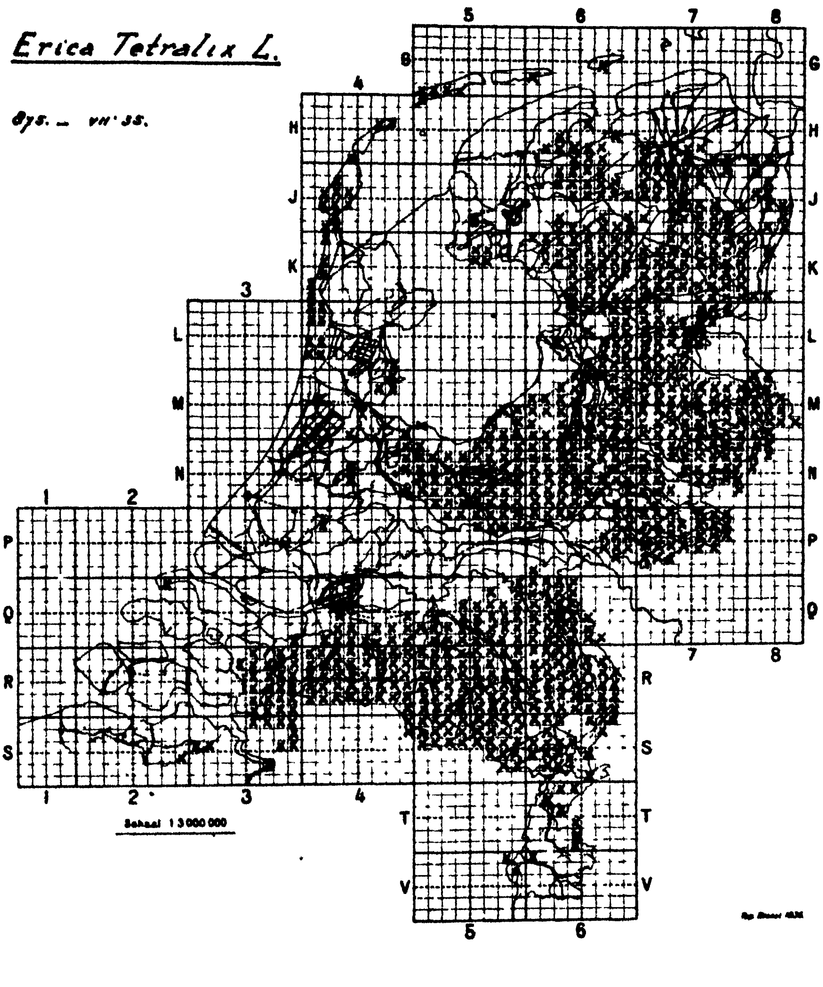
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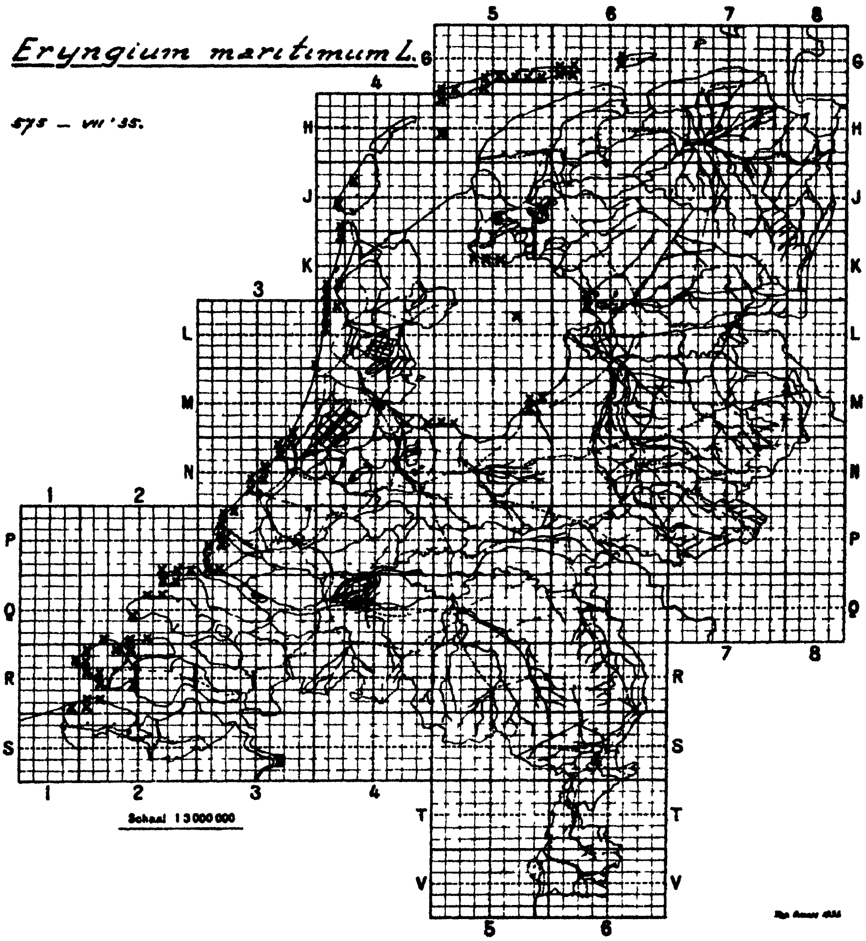
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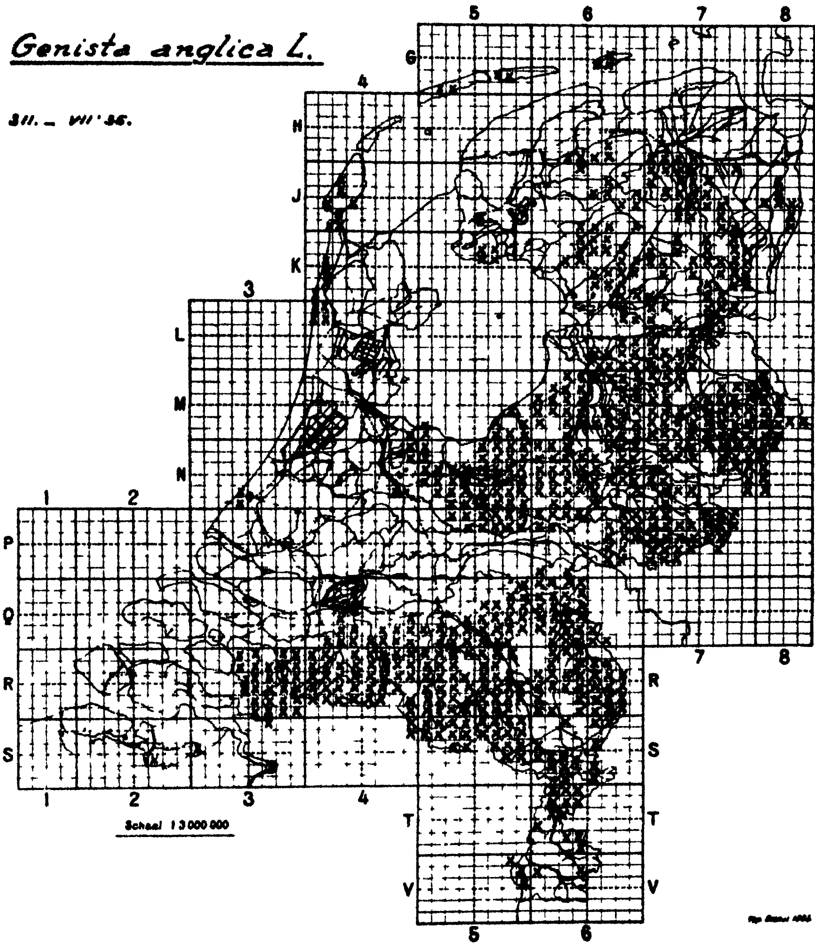
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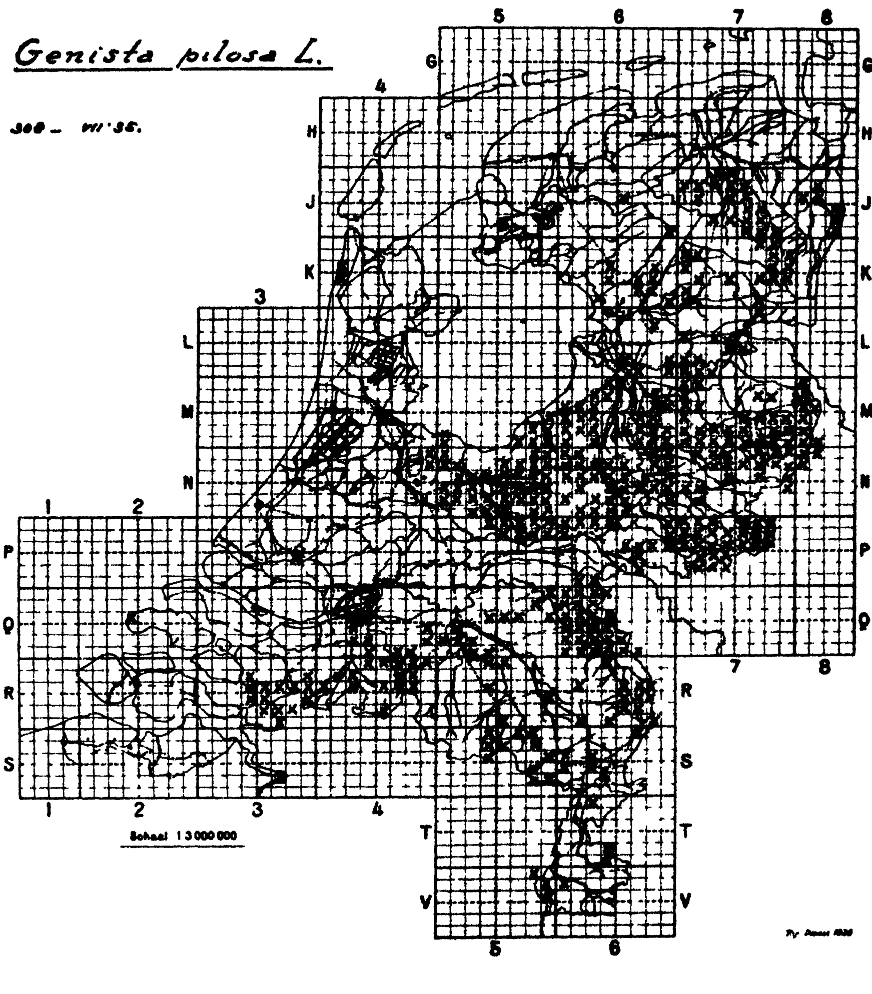
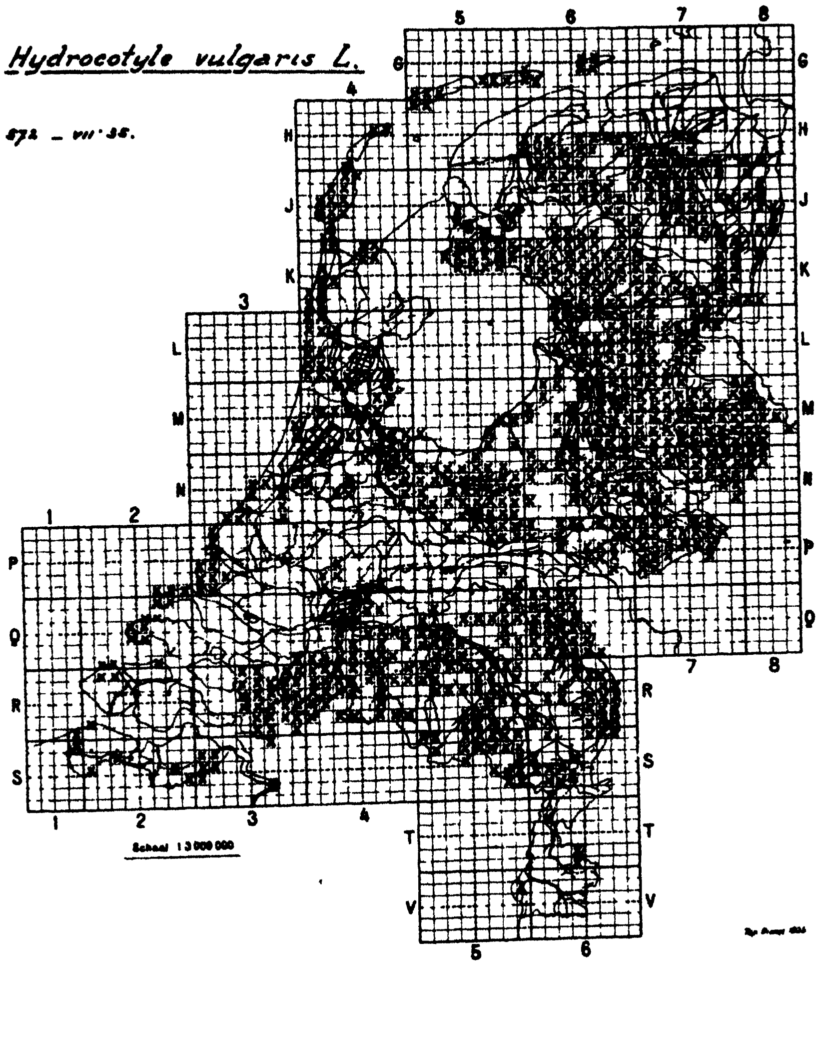
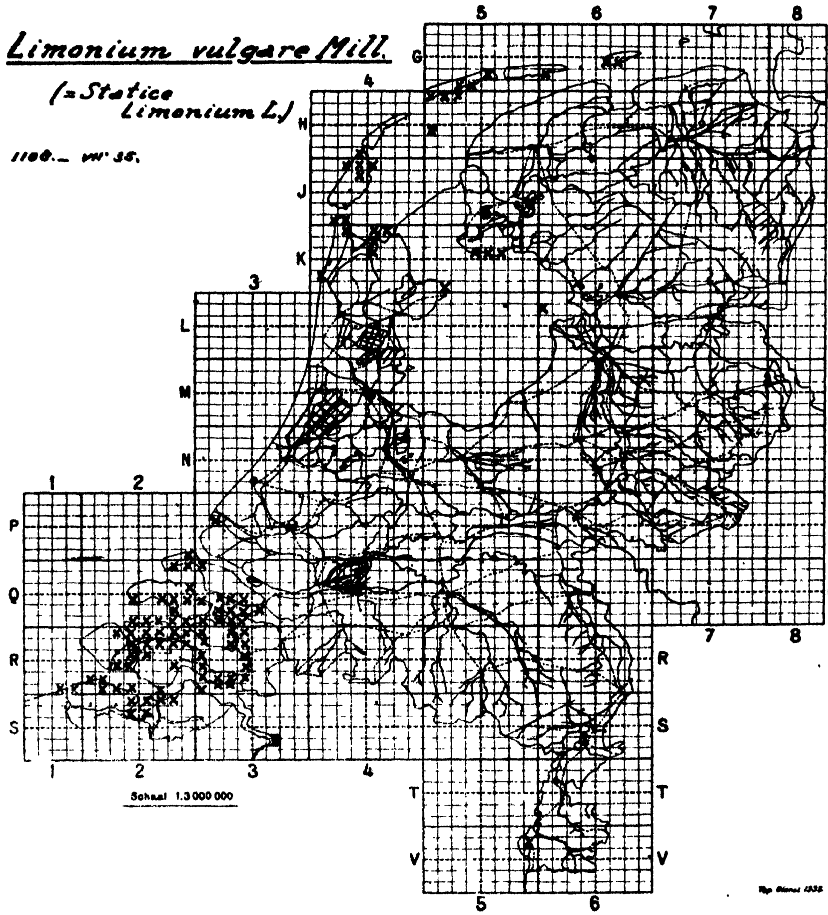
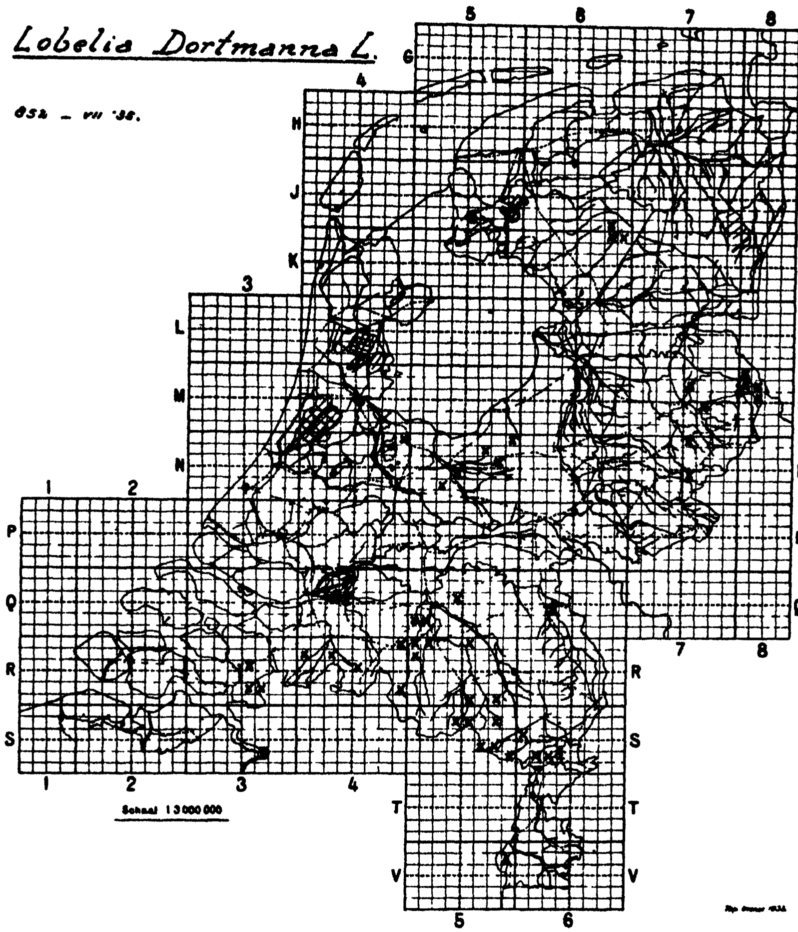


Genista pilosa L.
Schaal 1:3000000


Hydrocotyle vulgaris L.
872 – VII '35.
Schaal 1 3 000 000


Limonium vulgare Mill.
(= Statice
Limonium L.)
Schaal 1:3000000


Lobelia Dortmanna L.
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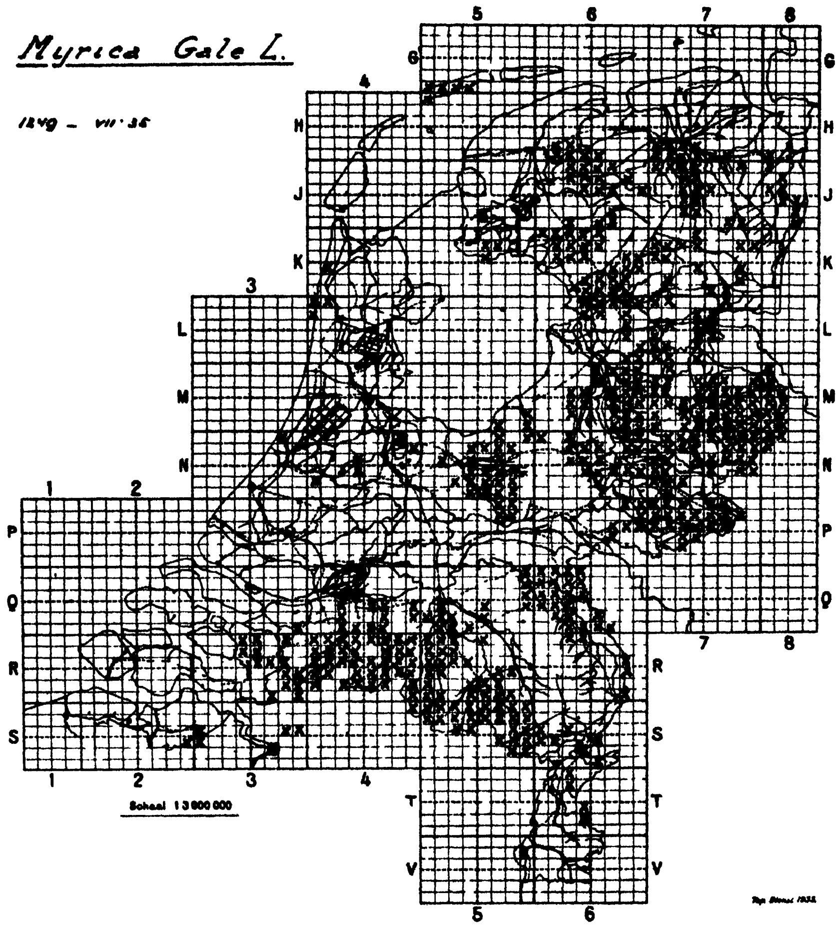
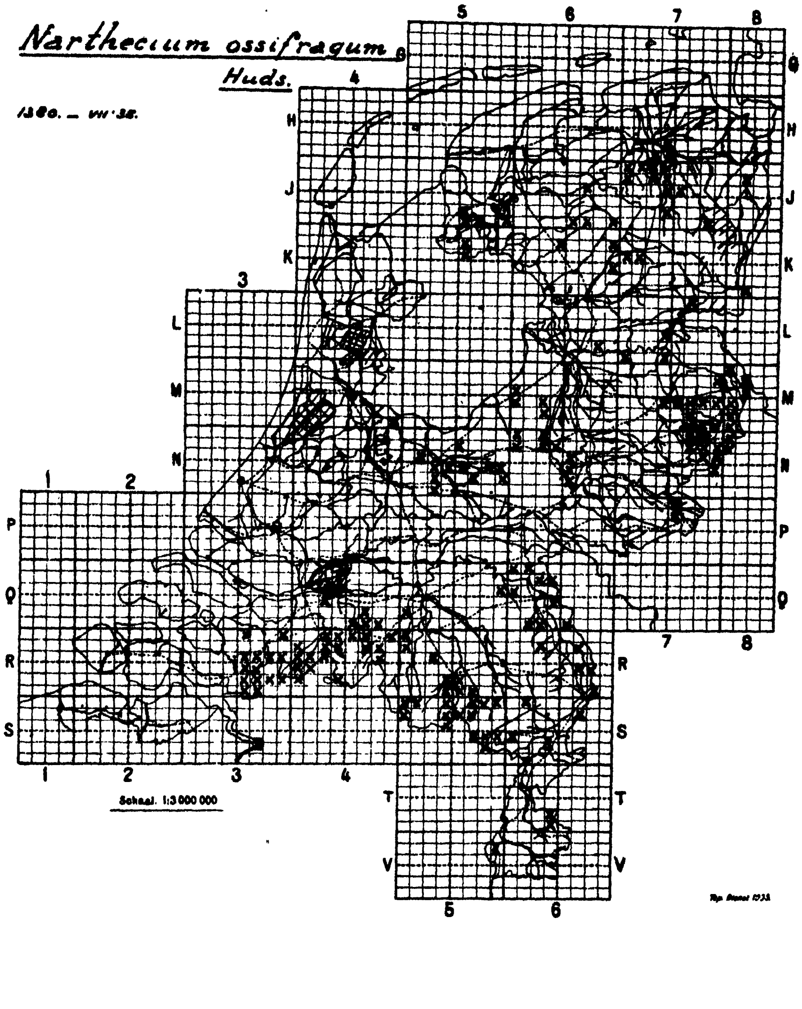
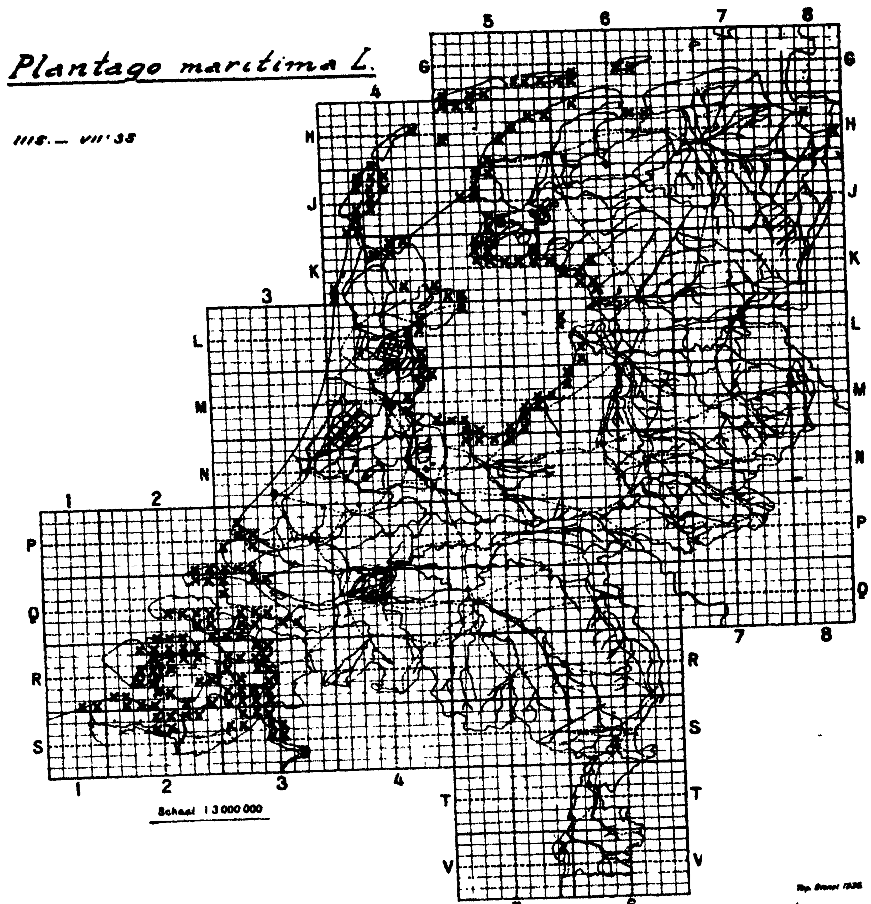
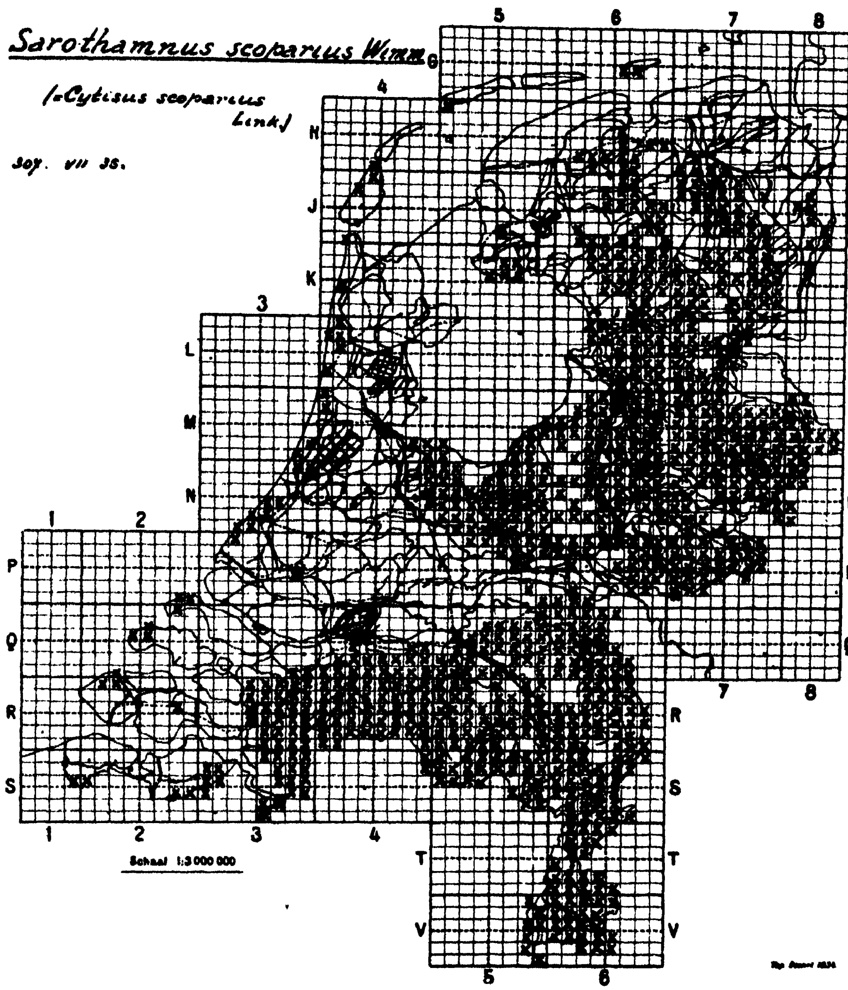

Myrica Gale L.
1249 — VII '36
Schaal 1:3000000
1 2 3 4 5 6 7 8
G H J K L M N P Q R S T V


Narthecium ossifragum
Huds.
Schaal. 1:3 000 000


Plantago maritima L.
1115.— VII'35
Schaal 1:3000000


Sarothamnus scoparius Wimm.
(=Cytisus scoparius Link)
30/. VII 35.
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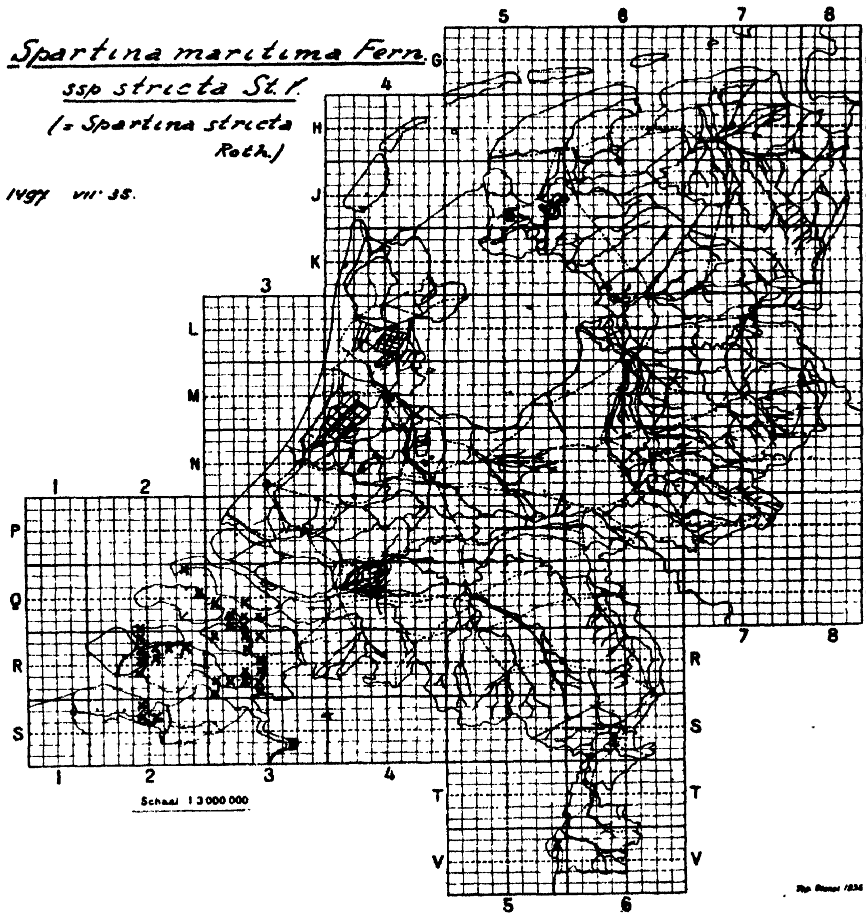
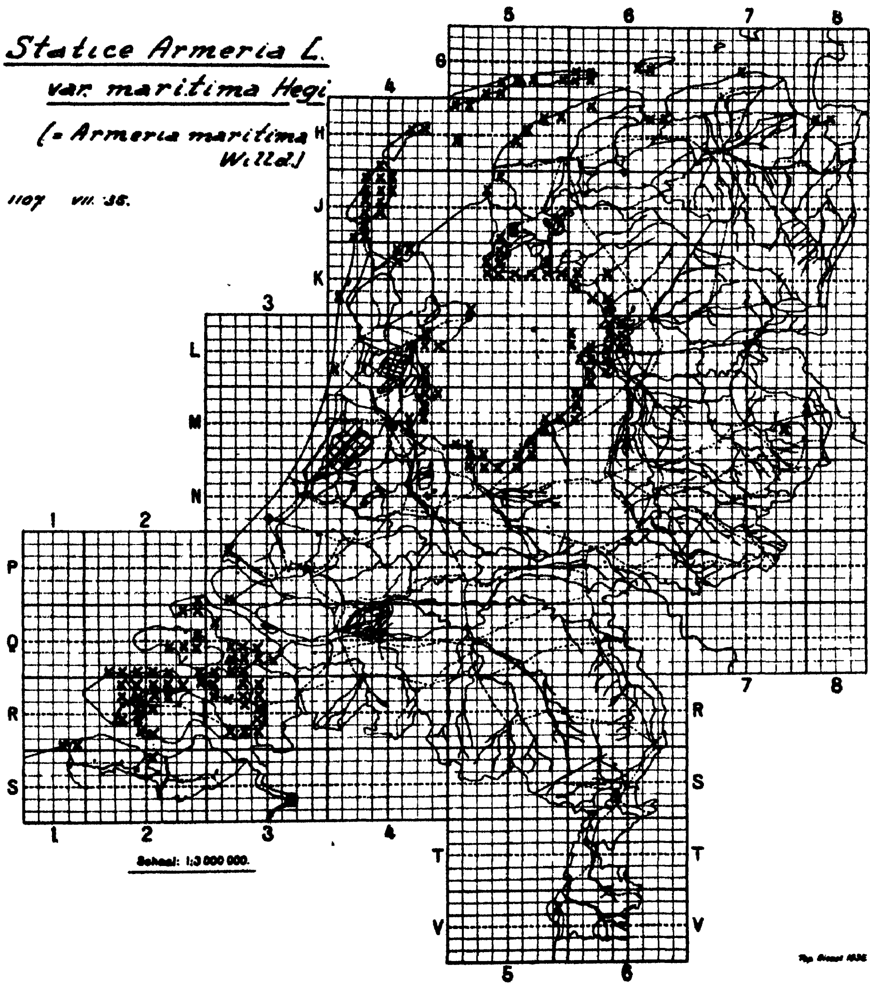
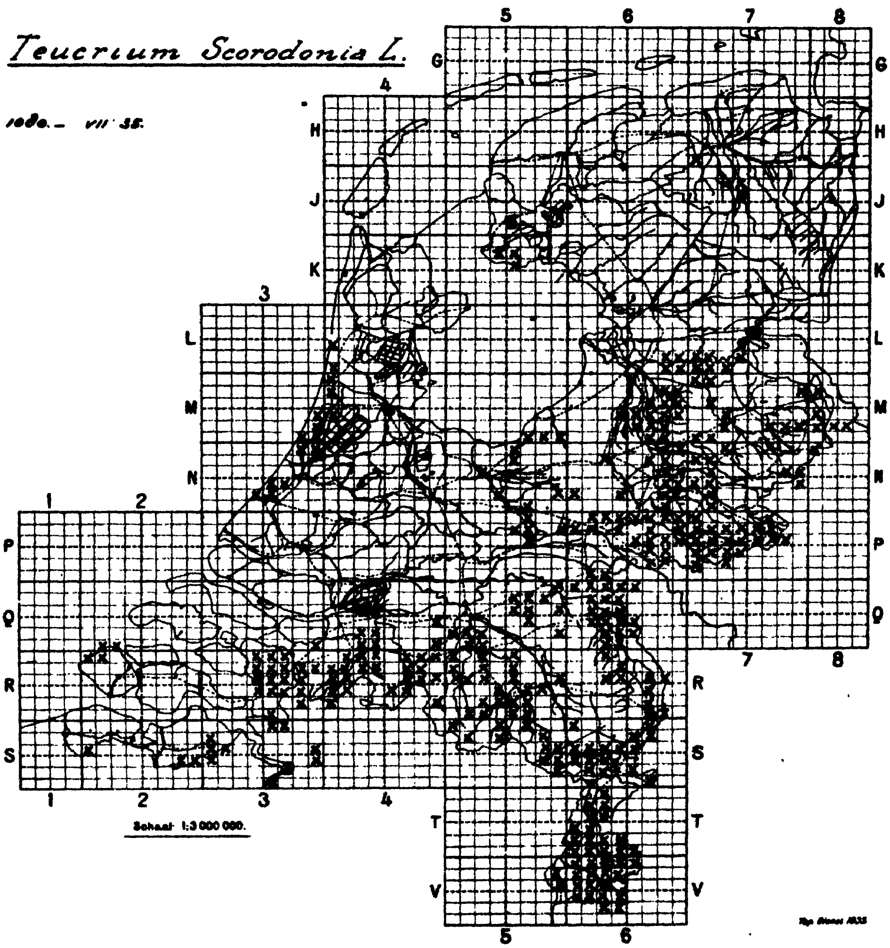
Schaal 1:3 000 000

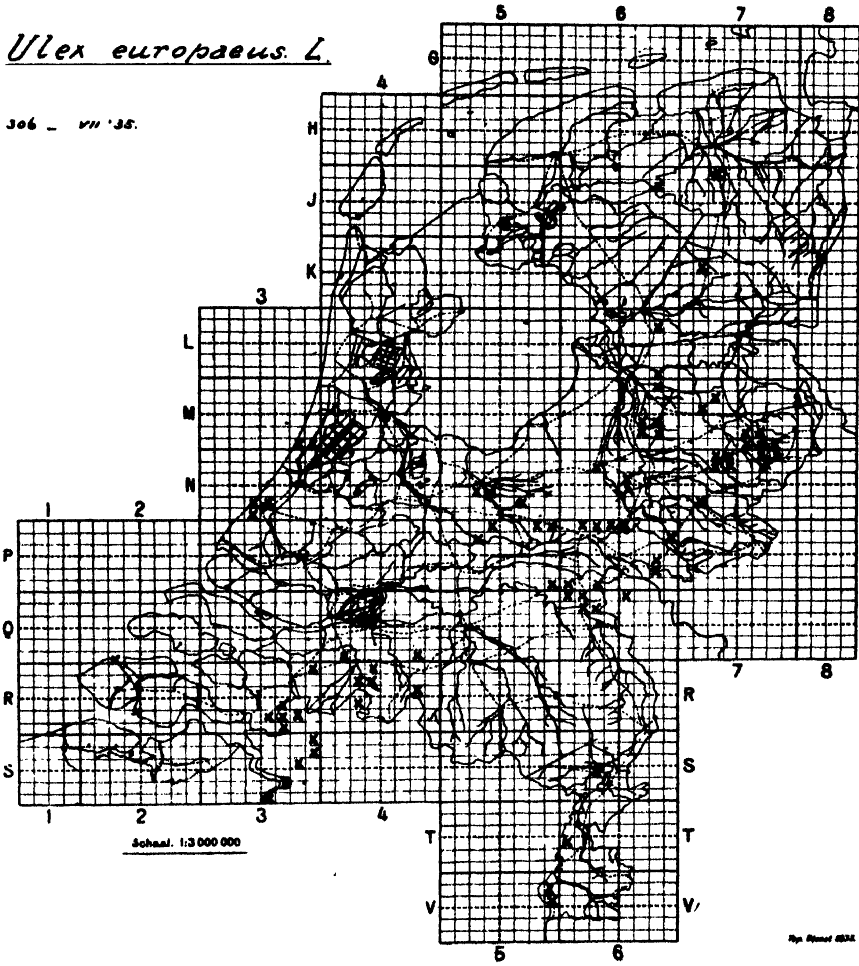

Spartina maritima Fern.
ssp stricta St. l.
(= Spartina stricta
Roth.)
1497 VII '35.
Schaal 1:3000000


Statice Armeria L.
var. maritima Hegi
(= Armeria maritima Willd.)
1107 VII '38.
Schaal: 1:3 000 000.


Teucrium Scorodonia L.
1080.– VII 35.
Schaal 1:3 000 000.

Ulex europaeus L.

306 — VII '35.



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EINE NEUE MORIOLA AUS JAVA.

von

E. BACHMANN

(Königsberg).

Mit 1 Tafel.

Unter allen Flechten unterscheidet sich die nur aus Norwegen bekannte Gattung *Moriola* dadurch, dass ihr Lager aus Goniocysten besteht, das sind kugel- oder länglichrunde oder unregelmässig gestaltete braune Behälter mit netzartiger Oberfläche, von denen braune, zylindrische oder schwach torulöse Hyphen entspringen und bis zur nächsten, manchmal weit entfernten Goniocyste hinkriechen. Auf diesem Wege, auch wenn sie zu mehreren nebeneinander herlaufen, vereinigen sie sich nie zu einer strauch-, oder blatt-, nicht einmal zu einer krustenformigen Lagermasse. Diese besteht ausschliesslich aus zerstreuten Goniocysten und den sie verbindenden Hyphen, die bei *Moriola pseudomyces* (Fig. 1—4) meist über morschem Holz, bei *Moriola sanguifica* über fremdem Algenlager ausgebreitet sind. Die braune Panzerkruste der Goniocysten entsteht dadurch, dass die dünnen zylindrischen Hyphenzellen unter Beibehaltung ihrer Dicke (2 μ), stark in die Breite wachsen und die Gestalt von Kugelsektoren annehmen. Sie werden meistens nicht viel über 2 μ dick, können aber bis 4 μ dick werden, wenn sich die Aussenwand höckerartig verdickt. Näheres hierüber in meiner Osloer Arbeit [1]) und in den Berichten der Deutschen Botanischen Gesellschaft [2]).

Die Früchte einer von Herrn P. Groenhart an mich übersandten Flechte (Fig. 5—7) sind von ihm in 3000 m Höhe auf Java gesammelt worden und entwickeln ihre sporenreichen Perithezien auf einem etwa 1 cm mächtigen, lockeren Lagermasse von fast rein schwarzer Färbung. Diese rührt von Holzkohle her, die in grösseren oder ganz kleinen Bruchstücken, selten in Form angekohlter Zweige zwischen und unter

[1]) Ewald Bachmann, Die Moriolaceen. Saertryck av Nyt Magazin Naturvidenskaberne. Bd. 64. Mit Tafeln u. 13 Textabb.

[2]) Berichte d. Dtsch. Botan. Gesellsch. Bd. 33, Berlin 1925.

den Goniocysten liegen. Die in den Goniocysten der tieferen Schichten enthaltenen Gonidien sind alle abgestorben und sehen jetzt braun aus. Nur in den Goniocysten der obersten Schicht sind die Gonidien noch jugendfrisch, sehen hellgrün aus und heben sich deutlich von der dunkelbraunen, 4 μ dicken Kruste ab: eine einfache d.h. einkammerige Goniocyste mit 21.8 μ Durchmesser, so dass auf den Innenraum fast 14 μ Durchmesser kamen; in ihr hatten drei Gonidien Platz. Bei einer anderen, zusammengesetzten Goniocyste hatte sich an diametral gegenüberliegenden Punkten der Goniocyste je eine Gonidie angesetzt und war von der braunen Kruste auch noch umwachsen worden, so dass die beiden kleinen Endkammern je eine Gonidie enthielten, die Mittelkammer deren drei. Es kommen aber auch noch grössere zusammengesetzte Goniocysten vor, deren Mittelkammer 5 und mehr Gonidien enthält.

Die äusserste Goniocystenschicht enthält stellenweise auch Perithezien, meist kugelrunde, nach oben etwas zugespitzte, bräunlichwandige Behälter für die sporenerfüllten Schläuche. Die Perithezien haben 200 μ Durchmesser oder wenig darüber und führen in breiten Schläuchen zweizellige, farblose Sporen, unterscheiden sich also wesentlich von der norwegischen *Moriola*. Die von GROENHART entdeckte javanische Flechte ist wegen ihrer Goniocysten eine echte *Moriola*, gehört aber in keine der beiden für Norwegen aufgestellten Sektionen: *Eu-* und *Paramoriola*, sondern erfordert die Aufstellung einer dritten Sektion, für die ich den Namen *Groenhartia* vorschlage. Die neue Flechte erhält also den Namen:

Gatt.: *Moriola* NORMAN
Sect.: *Groenhartia* BACHMANN
Art: *nigra* GROENHART

Beischrift von P. GROENHART *(Malang, Java)*.

Die Entdeckung meiner *Moriola* war nur eine sehr zufällige und nicht weniger eine erfreuliche. Es war zu erwarten, dass jede lichenologische Forschung auf Java noch viel Neues und Interessantes ergeben würde, aber dass eine bis heute nur auf Norwegen beschränkte Gattung auch da zu finden sein würde, hatte ich nicht vermutet. Da die *Moriolaceae* mir völlig unbekannt waren, sandte ich Herrn Prof. BACHMANN ein kleines Thallusstück mit der Bitte meine Bestimmung mit

Bezug auf den Goniocysten kontrollieren zu wollen. Seine Befunde hat er in obenstehende Notiz niedergelegt und es erübrigt mir jetzt eine nähere Beschreibung der Flechte zu geben.

Die Stellen, wo die Flechte wächst, haben das Aussehen von Brandflecken zwischen dem Moos und leider habe ich sie auch dafür angesehen. Nur nachdem ich eine andere Flechte, welche ich auf und zusammen mit einer solchen Brandfleck eingesammelt hatte, studierte, entdeckte ich die winzigen Perithezien. Mit dem unbewaffneten Auge oder selbst bei Lupenvergrösserung ist ein deutlicher Thallus nicht zu unterscheiden. Nur hie und da seht man auf einer grauschwarzen, kohligen oder mehr weniger verwitterten und ausgebleichten Unterlage braunschwarze Stellen, welche, wie eine mikroskopische Untersuchung ergibt, von dichter verwebten Thallushyphen herrühren. Wenn man die Stellen mit Wasser benetzt, wird das Wasser begierig aufgesogen, das Ganze wird dunkler aber ein deutlicheres Hervortreten des Thallus findet nicht statt. Auch Reagenzien geben kein Resultat.

Anatomisch stimmt der Bau des Thallus völlig mit Bachmann's Beschreibung (Nyt Mag., Bd. 64, 1926) überein. Auch hier gehören die Algen der Unterlage zu verschiedenen Spezies und werden von den Thallushyphen mehr weniger berührt, jedoch scheint nur stets eine und derselbe Art in den Goniozysten eingehüllt zu werden. Im allgemeinen sind die Hyphen und Goniozysten in der oberen Schicht braun und werden nach unten zu allmählich farblos. Dasselbe gilt auch von den Perithezien, wobei die Wand von aussen nach innen von braunschwarz zu farblos übergeht. In KOH werden die braunen Hyphen schwarz und tritt in den Algen hie und da eine goldgelbe Reaktion auf.

Wesentlich verschieden sind die Schläuche und Sporen. Bei den norwegischen *Moriolaceae* sind die Schläuche walzlich und schmal keulenförmig und die Sporen braun und parallel mehrzellig bis mauerförmig. Bei der javanischen Art sind die Schläuche breit keulenförmig mit am Scheitel stark verdickter Wand, während die Sporen farblos, zweizellig [1]) und ovoid sind. Von den beiden Zellen ist die Scheitelzelle breiter und meistens grösser als die andere Zelle.

Auf Grund dieser Unterschiede konnte ich die javanische Art nicht bei einer der Untergattungen Bachmanns einreihen und meinte ich die Aufstellung einer neuen Gattung vorschlagen zu müssen. Die Antwort hierauf ist bereits von Bachmann gegeben (s. o. und Nyt Mag., Bd. 64, S. 199).

[1]) Nur in einem Ascus fand ich, ausser den normalen zweizelligen, eine 4-zellige Spore.

Moriola nigra, nova species (Fig. 5—7).

Thallus goniocystialis ex hyphis fuscis vel decoloribus et goniocystibus formatus. K—, Ca—, KCa—. Hyphae thalli laxe contextae, leptodermatices, 5—6 μ latae, septatae (cellulis usque ad 22 μ longis), increbre ramosae et ramos directos emittentes, in parte thalli superiore fuscae, in parte inferiore decolores. Goniocystia globosa, in parte thalli exteriore in capsulis fuscis omnino clausis, in KOH nigris, p.p. libera, p.p. conglutinata; in parte thalli inferiore in capsulis retiformibus decoloribusque, minus conspicua, conglomerata; diam. 20—80 μ. Cellulae capsularum diversiformes, ± 3 μ altae, usque ad ± 7.5 μ longae, membranis tenuibus, sed membrana exterior convexa crassior est quam membrana interior concava. Gonidia goniocystium globosa, laete viridia, cyanophycea, parte supra substratum algis diversarum specierum suffulta.

Apothecia pyrenocarpica, numerosa, dispersa vel approximata, sessilia, globosa vel leviter depresso-globosa, rarius ad apicem attenuata, ad basin constricta, a thallo omnino libera, opaca vel subnitida, nigra, 0.2—0.3 mm lata, poro terminali tenuissimo pertusa. Excipulum integrum, extus nigrum vel fusco-nigrum, intus decoloratum, ex hyphis parallelis, septatis, pseudoparenchymate connectis, fusco-nigris vel decoloribus formatum. Hymenium decolor, pellucidum, J + lutescens, K + lutescens. Paraphyses in gelatinam diffluxae. Asci late clavati, superne rotundati, membrana bene incrassata, 6- (8-?) spori. Sporae

Figurenerklärung.

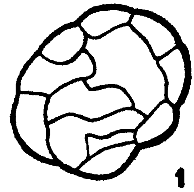
Fig. 1–3. Goniocysten von *Moriola pseudomyces* NORM.

1. Aussenansicht einer jugendlichen, einkammerigen Goniocyste. Durchmesser 12.3 μ;
2. Querschnitt einer abgestorbenen, zweikammerigen Goniocyste. Nur eine der beiden Kammern enthält noch ein schon mehr als halb entleertes Gonidium. Durchm. 32.5 × 25 μ;
3. Querschnitt einer fast halben, jugendlichen Goniocyste mit etwa 40 jugendfrischen Gonidien und vielen zarten Innenhyphen. Durchm. 73.5 μ (BACHMANN, orig.).

Fig. 4. Zwei Schläuche mit 1- und 2-reihiger Anordnung der Sporen von *M. pseudomyces* NORM. (nach BACHMANN).

Fig. 5–7. *Moriola nigra* P. GROENH. — 5. Schlauch, 6. Spore, 7. Partie des Lagers mit Goniocysten (G), Hyphen (H), Substrat (S) und Perithezium (P). (GROENHART, original).

3



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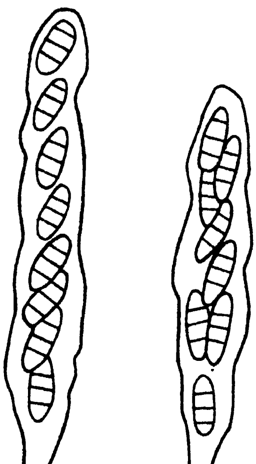

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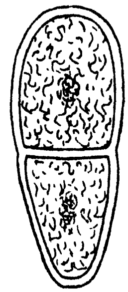

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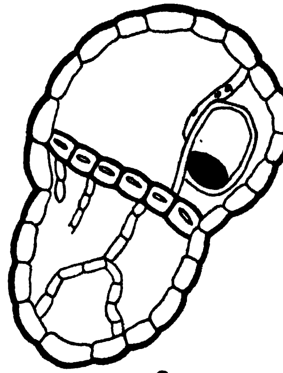

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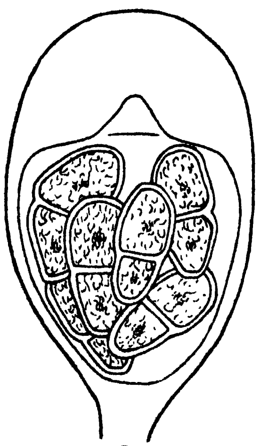


5

7

in ascis tri- vel pluriseriales, hyalinae, uniseptatae, ad septum interdum leviter constrictae, ad apices rotundatae, rectae vel leviter curvulae, ovoideae, 13—19 × 48—50 μ.

Java orientalis, in summo montis Welirang, ± 3000 m s.m., apud ruinas prope viam ad Kawah Ploepoh, supra algas intêr muscos ad terram. Leg. P. GROENHART, Typus in herb. meo, no. 798.

ARCHBOLDIA, A NEW VERBENACEOUS GENUS FROM NEW GUINEA

by

EVA BEER and H. J. LAM.

Archboldia, nov. gen. — *Frutices; folia* opposita; *inflorescentiae* terminales, paniculato-corymbosae, e cymis compositae; *calyx* plus minusve patens, infundibuliformis, 5-lobatus; *corolla* exserta, ventricoso-cylindrica, utrinque glabra, actinomorpha, breviter 5-lobata; *stamina* 4 alternipetalia, introrsa, dorsifixa haud exserta, monodynamia, corollae paulo sub fauce inserta, breviter filamentosa; *ovarium* 4-sulcatum, bicarpellatum, imperfecte 4-loculatum, ovula 4 anatropa placentis basi-parietalibus inflexis affixa; stylus haud exsertus, stigmate subulato; cetera desunt.

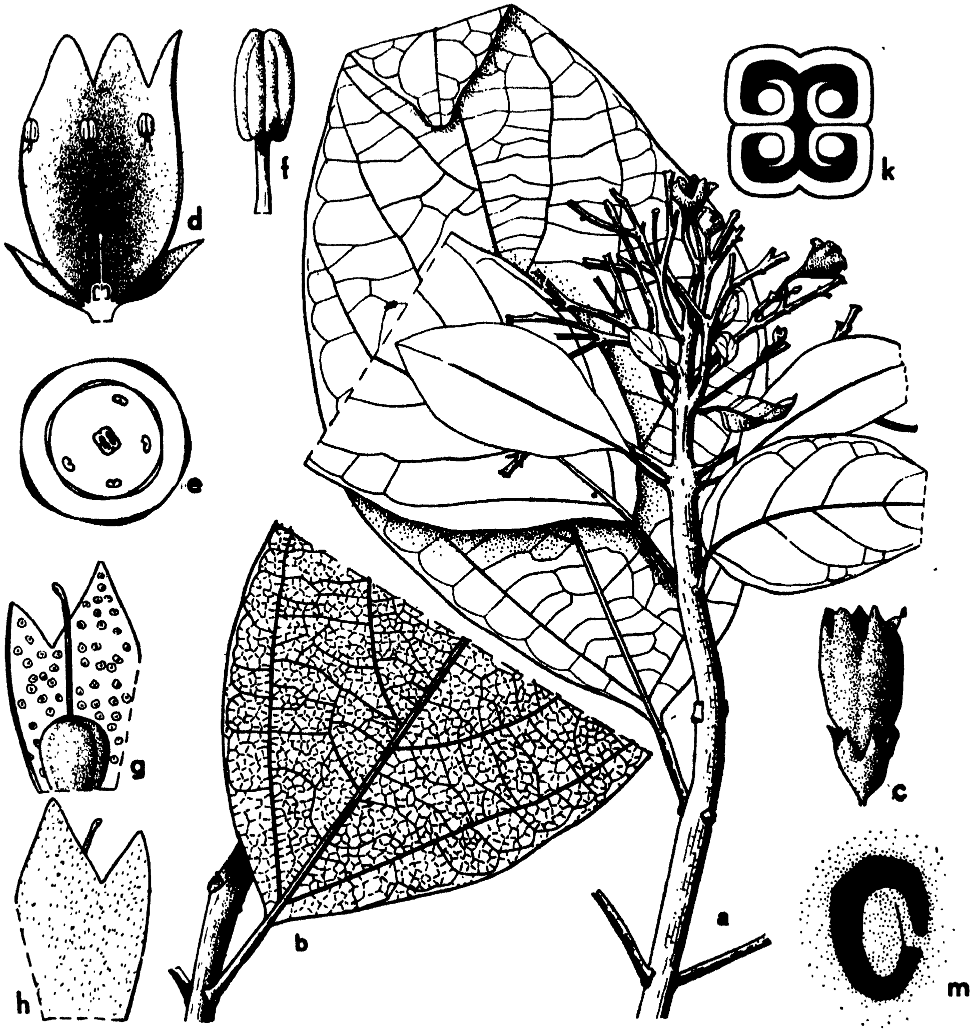
Though the material is very scanty and not very well preserved, we may suppose with some probability that this is the representative of a new genus. It cannot be combined with any Verbenaceous genus thusfar known from Malaysia, New Guinea, Australia or Polynesia, being particularly distinguished by its peculiarly glabrous, inflate and actinomorphous corolla and its mododynamous and very short stamens. These features remind somewhat of certain Ericaceae, hence the specific name, chosen for the only species known at the time.

As the ripe fruit and the seed are unknown, it is difficult to say something definite on the taxonomic relations of the genus. It could possibly be placed in the subsection *Chloanthoideae-Physopsideae*, which is entirely of Australian distribution; however, *Archboldia* misses the woolly indumentum which is so characteristic for this group and the general habit reminds one strongly of *Faradaya (Viticoideae-Clerodendreae)*; I would provisionally consider it as an ally to the last-named group.

The genus is named in honour of Mr. RICHARD ARCHBOLD, leader of the 1933—34 New Guinea Expedition of the American Museum of Natural History.

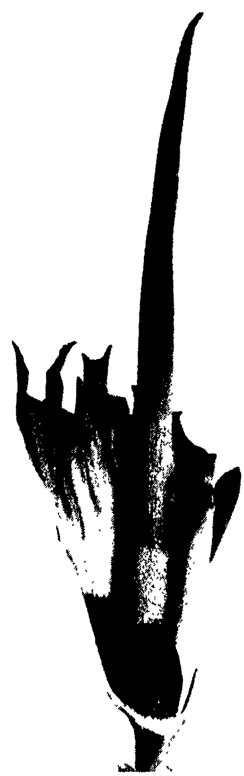
One species in New Guinea:

A. ericoides, nov. spec. — *Frutex* glabra vel subglabra; *ramuli* subquadrangulares; *folia* opposita, decussata, papyracea, ovata, basi late acuta, apice obtuse acuminata, margine integra, 14—17 cm longa, 7—8 cm lata, supra cum petiolo 1—2 cm longo glabra, subtus minute sparseque pubescentia; costa media i.s. supra vix, subtus valde prominens; nervi secundarii 5—7, distantes, basales oppositi, recti, fere ad folii dimidium adscendentes, ceteri curvati, omnes distincte prominuli; nervi tertiarii transversi, minutiores reticulati, subtus conspicui; *inflorescentia*



Archboldia ericoides, nov. gen., nov. spec. — a. leaves and inflorescences; b. part of leaf, showing venation; c. flower; d. id., longitudinal section; e. id., diagram; f. anther; g. calyx inside, with ovary and style; h. calyx outside; k. cross section of ovary; m. position of ovulum at longitudinal section. — C. MULDER del.

basi foliosa terminalis, e pedunculo brevi late corymbosa, circ. 6—8 cm longa et lata, minutissime pubescens vel subglabra, cymae pauciflorae decussatae, bracteae caducae; *flores* majusculi, pedicelli 0.1—0.2 cm longi, cum calyce extus sparse adpresse minuteque pubescentes; *calyx* extus sparse minute pilosus, intus glaber, glandulis minutis aureofulvis suffultus, 0.6—0.7 cm longus, lobi deltoidei 0.3 cm longi, acuti; *corolla* utrinque glabra subcarnosa circ. 2 cm longa, tubo subinflato 0.7—0.8 cm diam., lobi obtusi circ. 0.4 cm longi; stamina glabra, antherae et filamenta circ. 0.15—0.2 cm longi; ovarium glabrum, minutum; stylus glaber, brevis.



Amorphophallus plicatus, *n. sp.*

New Guinea: Papua, Western Division, Wuroi, Oriomo River; edge of small swamp in savannah forest, 30 m in alt. (L. J. BRASS, no. 6025, *type specimen*). Shrub, about 1 m, one example, with a few erect branches from enlarged stock; branchlets, petioles and underside of midribs purple; fruits very young red, in Jan.—March 1934.

A NEW AMORPHOPHALLUS FROM CELEBES

by

MARIE B. BOK & H. J. LAM

(Leiden).

Amorphophallus plicatus, nov. spec.

Tuber et folium non videmus; unam spadicem glabram tantum videmus. Cataphylla 3 oblongo-lanceolata, 33, 19, 17 cm longa, 6.7, 2.8, 4.5 cm lata, apice obtusa, duo ut apparet basi, unum (brevissimum) pedunculi apice affixa. Pedunculus 4.5 cm longus et i. v. 2.1 cm (i. s. 1.9 cm) crassus. Spatha 25 cm longa, late campanulata, basi convoluta, margine laciniata, marginem versus valde plicata, intus basin versus purpurea (?) et minute papillosa, supra pallidior, laciniae inaequales usque ad 9 cm longae. Spadix quam spatha duplo longior, 45 cm longa; inflorescentia feminea cylindrica, circ. 5.5 cm longa, 2.5—2.8 cm crassa; mascula arcte contigua basi paulo constricta, circ. 5 cm longa, 2—2.5 cm crassa; appendix 36 cm longa, anguste cylindrica, sensim attenuata; flores masculini plus quam flores feminei congesti. Ovarium globosum sessile, 3-loculare, apice in stylum attenuatum; stylus ovario subaequilongus vel (paulo) longior; stigma non vel obscure 2-lobata. Stamen solitarium circ. 1 mm longum, 2 mm latum; antherae adnatae apice 2 poris dehiscentes.

Celebes: N. Celebes, Bolaang-Mongondou, Modajag, 750 m in alt., in forest (leg. W. KAUDERN 243, Oct. 1917, type spec. in Herb. Stockholm).

Remarks: As two of the cataphylls were detached, the length of the peduncle is not quite certain; however, the peduncle is somewhat dilated at base, which suggests an attachment to the tuber. The third (smallest) cataphyll is inserted immediately below the spatha (cf. *photograph*, right hand side).

Related to *A. Rivieri* DURIEU from Cochinchina, cf. ENGLER in Pflanzenreich IV, 23 C, 1911, 85 and to *A. Merrillii* KRAUSE, from the Philippines, in Notizbl. Bot. Gart. Berl. 5 No. 49, 1912, 266, but distinguished from these two by the short peduncle and the deeply laciniate and plicate spatha.

MISCELLANEOUS NOTES ON LORANTHACEAE 9—15.

(Nrs. 1—8 in Recueil Trav. Bot. Néerl. 31, p. 223—236 and 751—760, 1934)

by

B. H. DANSER

(Botanical Laboratory of the University, Groningen, Holland)

With 2 figures.

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9. Amylotheca micranthes Dans., n. sp.

Ramulus c. 2 mm crassus, apice paulum incrassatus, ad 5 mm dilatatus, 2 folia et 2 inflorescentias ferens, superficie tenuiter ferrugineo furfuraceus. Folia opposita; petiolus ut costae pars basalis ferrugineo furfuraceus, c. 8 mm longus, basi tereti c. 1.5 mm crassus, laminam versus supra applanatus; lamina oblonga, 6.5—7 cm longa, 3 cm lata, sub basi rotundata abrupte in petiolum contracta, apice rotundata, faciebus vix diversis, costa basin versus facie inferiore paulo distinctiore quam facie superiore, ceterum utrinque opaca, costa nervisque crassioribus paulum prominentibus distinctis, venis indistinctis sed visibilibus. Inflorescentia racemus triadum decussatarum floribus omnibus sessilibus; axis 3—3.5 cm longus, teres, nodis paulum applanatis, a basi c. 1 mm crassa apicem versus ad c. 0.5 mm attenuatus, in c. 6 mm inferioribus nudus, ceterum 6—7 paria triadum decussata ferens; pedicelli triadum inferiorum c. 1 mm longi, superiorum gradatim ad 0.5 mm decrescentes, 0.75—0.5 mm crassi, teretes; bracteae bracteolaeque suborbiculares, 1—1.25 mm longae, rotundatae vel breviter acuminatae. Calycis tubus subcylindricus, 2—2.5 mm longus, 1 mm latus, limbus erectus 0.5—0.75 mm longus, margine plerumque irregulariter laceratus et patens. Corolla statu alabastri adulti 6—7 mm longa, subcylindrica, in 2 mm superioribus paulum incrassata, apice obtusa, postea usque ad basin divisa in petala 6 sublinearia, 7—8 mm longa, c. 0.4 mm lata, parte superiore c. 2 mm longa reflexa paulo latiore apice obtusiuscula crassiuscula. Filamenti pars libera 0.25—0.5 mm longa; anthera c. 1.25 mm longa, acutiuscula. Stylus 6—7 mm longus, 6-angulus, a basi ad apicem paulum attenuatus; stigma styli apice paulo crassius, rotundatum. Cetera ignota.

Island Biak (north of New Guinea), near Bosnèk, on the coast, on coral limestone covered with terra rossa, Sept. 2, 1915,

FEUILLETAU DE BRUYN 369 (B), with the remark „shrub 3 m high, with a stem 10 cm in diameter, flower light-green", bearing, at least partly, on the host tree.

Description after a single twig extremity bearing 2 leaves and 2 complete flowering inflorescens, found by VALETON among *Rubiaceae*. It is strikingly different from all *Amylotheca* species known, by extremely small flowers, and approaching in this respect only the Philippine *A. tenuis* and *A. apodotrias* DANSER [Philipp. Journ. Sc., 58, 1 (1935) p. 9 et 8] with corollas respectively 13 and 11 mm long.

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10. New delimitation proposed for some genera of Elytranthinae.

The examination of some *Elytranthe* species of the Asiatic continent convinced me of the necessity to alter the limits of *Elytranthe* as accepted by me up to the present (Verh. Kon. Akad. Wetensch., Amsterd., afd. Natuurk., sect. 2, 29, 6, p. 4, 50). In this genus I distinguished (l. c. p. 15—16) 3 subgenera that perhaps deserved generic distinction, viz. *Coeloma, Pseudocephala,* and *Blumella*, and in *Lepidaria* (ibidem) 2 subgenera, viz. *Strobilaria* and *Lepidella*. Now *Blumella* proved to be only superficially differing, and therefore not to be separable, from *Macrosolen*, and *Pseudocephala* not from *Lepidaria* subg *Strobilaria*, so that for *Elytranthe* there only remain the species formerly put into the subg. *Coeloma*. Moreover these so-called species of *Elytranthe* all proved to be synonymous, in spite of slight differences, and the genus *Elytranthe* thus becomes a monotypic genus. In transferring *Elytranthe arnottiana* to *Lepidaria* I prefer to divide, at the same occasion, the latter genus into *Lepidaria, sensu strictiore,* and *Lepidella.*

The following scheme may elucidate this alteration.

Old names.	Subgenera.	New names.
Macrosolen		*Macrosolen*
Elytranthe	*Blumella*	*Macrosolen*
Elytranthe	*Coeloma*	*Elytranthe*
Elytranthe	*Pseudocephala*	*Lepidaria*
Lepidaria	*Strobilaria*	*Lepidaria*
Lepidaria	*Lepidella*	*Lepidella*

The system of the *Elytranthinae*, now necessary, is given in the following scheme, including also the alterations made necessary by

the distinction of the genus *Thaumasianthes,* and the correction of *Cyne* and *Lepeostegeres* (Rec. trav. bot. néerl., 30, p. 464—474).

3a Flowers in triads, these triads united into larger inflorescences.
- 4a Inflorescence a raceme, a spike, or an umbel of triads.
  - 5a Anthers basifixed . . . . **Amylotheca**
  - 5b Anthers dorsifixed (immobile) . . . . **Loxanthera**
- 4b Inflorescence a head-like umbel of triads with an involucre . . **Lampas**
- 4c Inflorescence a simple head.
  - 5a Head with an involucre of decussate bracts . . . . **Lepeostegeres**
  - 5b Head with cucullate involucre of one piece . . . . **Cyne**
- 4d Inflorescence a composite head, all bracts of which bear 3 flowers or the interior ones less, all flowers with one bract and 2 bracteoles **Thaumasianthes**

3b Flowers not in triads, single in the inflorescences.
- 4a Corolla choripetalous . . . . **Peraxilla**
- 4b Corolla sympetalous.
  - 5a Each flower with 3 bracts (1 bract and 2 bracteoles).
    - 6a Inflorescence a raceme, a spike, or an umbel.
      - 7a Corolla without thin-walled, enlarged part at the base.
        - 8a Flower 6-merous . . . . **Macrosolen**
        - 8b Flower 4-merous . . . . **Trilepidea**
      - 7b Corolla at the base with a thin-walled, enlarged part . **Elytranthe**
    - 6b Inflorescence a head-like, condensed, sessile spike, with imbricate bracts, but with prolongated axis, usually more than 4-flowered . . . **Lepidaria**
    - 6c Inflorescence a real head, with flat receptacle, 4- or less-flowered . **Lepidella**
  - 5b Each flower with a single bract.
    - 6a Flowers in racemes. Bracts deciduous . . . . **Alepis**
    - 6b Flowers in umbels. Bracts persistent . . . . **Lysiana**

The nomenclatorial consequences of these alterations of the genus-limits are the following.

The species placed hitherto in *Macrosolen* remain in this genus. To these are added 3 species, formerly placed into *Elytranthe* and there making out the section *Blumella.* They are:

Macrosolen capitellatus (WIGHT & ARN.) DANS., nov. comb.; *Loranthus capitellatus* WIGHT & ARN., Prodr. Fl. Pen. Ind. Or., p. 382 (1834) &c.

This can hardly be taken apart from the following as a species.

Macrosolen parasiticus (LINN.) DANS., nov. comb.; *Lonicera parasitica* LINN., Sp. pl., ed. 1, 1, p. 175 (1753) &c. (cfr. l. c. p. 52), also: *Tolypanthus loniceroides* ETTINGSH., Denkschr. Akad. Wissensch. Wien, Math.-Naturwiss. Cl., 32, p. 53 (1872).

Macrosolen psilanthus (HOOK.F.) DANS., nov. comb.; *Loranthus psilanthus* HOOK.F., Fl. Br. Ind., 5, p. 222 (1886) &c.

In the genus *Elytranthe* there remains only one species, viz.:

Elytranthe albida (BL.) BLUME, for the synonyms of which cfr.

l. c. p. 52, to which also the synonyms of *E. Colletii* (l. c. p. 51), *E. dranensis* (l. c. p. 51), *E. Henryi* (l. c. p. 51), and *E. Petelotii* (l. c. p. 52) must be added.

In the genus *Lepidaria* we keep *L. bicarinata* VAN TIEGHEM, *L. oviceps* DANS., and *L. pulchella* DANS., whereas the following species must be transferred to it:

Lepidaria arnottiana (KORTH.) DANS., nov. comb.; *Loranthus arnottianus* KORTH., Verh. Batav. Genootsch., 17, p. 284 (1839) &c. (cfr. l. c. p. 50).

Into the genus *Lepidella* must enter the following species, kept by me in *Lepidaria* up to the present.

Lepidella biflora (VAN TIEGH.) DANS., nov. comb.; *Lepidaria biflora* VAN TIEGH., Bull. Soc. Bot. Fr., 42, p. 441 (1895) &c. (cfr. l. c. p. 63).

Lepidella Forbesii (KING) DANS., nov. comb.; *Loranthus Forbesii* KING, Journ. As. Soc. Beng., 65, 2, p. 100 (1887) &c. (cfr. l. c. p. 63).

Lepidella Kingii (KING) DANS., nov. comb.; *Loranthus Kingii* KING, Journ. As. Soc. Beng., 65, 2, p. 99 (1887) &c. (cfr. l. c. p. 64).

Lepidella malaiana (DANS.) DANS., nov. comb.; *Lepidaria malaiana* DANS., Bull. Jard. Bot. Buitenz., ser. 3, 11, p. 314 (1931) (cfr. l. c. p. 64).

Lepidella quadriflora (VAN TIEGH.) DANS., nov. comb.; *Lepidaria quadriflora* VAN TIEGH., Bull. Soc. Bot. Fr., 42, p. 441 (1895) &c. (cfr. l. c. p. 64).

Lepidella sabaënsis (STAPF) VAN TIEGH., &c. (cfr. l. c. p. 64).

Lepidella tetrantha (MERR.) DANS., nov. comb.; *Loranthus tetranthus* MERR., Phil. Journ. Sc., bot., 7, p. 79 (1912) &c. (cfr. l. c. p. 64).

Lepidella vaginata (VAN TIEGH.) VAN TIEGH., &c. (cfr. l. c. p. 64).

Lepidella Williamsii (MERR.) DANS., nov. comb.; *Loranthus Williamsii* MERR., Phil. Journ. Sc., bot., 4, p. 148 (1909) &c. (cfr. l. c. p. 64).

11. The Loranthaceae of Dr. Kaudern's Celebes Expedition.

Through the courtesy of the Direction of the State Herbarium at Leiden, I had the opportunity to revise a collection of Loranthaceae, collected by Dr. KAUDERN in Celebes, very small but so remarkable, that it seems to deserve a short publication. The 5 numbers it contains belong to as many species, of which one seems to be new to science, whereas one is very rare up to the present, and 2 are new for Celebes.

Macrosolen coriaceus DANSER, n. sp. — Omnis glabra. Stolonibus longis haustoriis crassis oblongis plantae nutrici affixa. Rami ramulique

teretes, internodiis foliiferis 2.5—5 mm crassis, nodis incrassatis applanatis ad duplo latioribus. Folia opposita vel subopposita vel etiam sparsa; petiolus basi subteres, laminam versus supra applanatus semiteres, 3—10 mm longus, 1.5—2.5 mm crassus; lamina ovata vel subelliptica, 6—12 cm longa, 2.5—7 cm lata, basi rotundata vel subcuneata, apice obtusa, crasse coriacea, penninervis nervis lateralibus incurvis, facie superiore lucidula nervis paulum prominentibus, facie inferiore opaca costa valde prominente nervis lateralibus subdistinctis. Inflorescentiae gregatim in axillis foliorum et numerosiores in axillis defoliatis, racemi paribus florum 2 vel 3 congestis; pedunculus ad 6 mm longus 1.5 mm crassus, apice dilatatus; axis florifer brevissimus; pedicelli 0.5—1.5 mm longi; bracteae bracteolaeque ovato-triangulares, ad 1 mm longae, obtusae vel subacutae. Calyx cylindraceus, 2.5—3 mm longus, 1.25—1.5 mm latus, limbo brevi integro erecto; corolla statu alabastri adulti ad 12 mm longa, in dimidia parte inferiore inflata, paulum sub medio alis angustis 6, parte dimida superiore in clavam obtusissimam ad 2 mm crassam 6-carinatam incrassata, aperta obscure rubra. Stylus c. 0.75 mm supra basin articulatus, rostrum breve 6-angulum pyramidatum in fructu relinquens. Flos apertus et fructus ignoti.

Island Banggai, Febr. 1920, W. KAUDERN 507 (L), parasite upon a pompelmoose tree, flowers dark red.

Dendrophthoë pauciflora DANS., in Bull. Jard. Bot. Buitenz., ser. 3, 11, p. 417, ic. 21, l-n (1931).

East Celebes, Loewoek, on limestone rocks near the sea-shore, Jan. 1920, W. KAUDERN 433 (L) small tree.

This species was described by me after rather incomplete materials, collected by RIEDEL and FORSTEN near Gorontalo and Kotaboena, and not bearing open flowers. The present materials, from Loewoek, though consisting of only few twigs, bear open flowers and so afford a wellcome completion of the description. To the original description may be added the following: Corolla aperta 13—15 mm longa, in 0.4 partibus inferioribus inflata ad 3.5 mm lata, 5-fida, tubo c. 4.5 mm longo, laciniis parte inferiore anguste triangulari, superiore anguste spathulata, apice acutiusculo crassiusculo. Stamina filamento c. 2.5 mm longo, anthera c. 2.5 mm longa obtusa. The specimens collected by KAUDERN moreover are entirely glabrous and bear young inflorescences that usually are 2-flowered, even the very young ones in the axils of the youngest leaves.

These specimens, like those already known before, resemble *Dendrophthoë pentandra* (L.) MIQ. by the appearance of the open flowers, but are strikingly different from all *Dendrophthoë* species known, by

the angular twigs, the peculiar shape and nervation of the leaves, and the conical fruit that is warty when well-developed.

Scurrula ferruginea (JACK) DANS., cfr. Bull. Jard. Bot. Buitenz., ser. 3, 11, p. 432 (1931).

East Celebes, Pinapoean, 600 m alt., on grass land where before stood tall forest, Dec. 1919, T. KAUDERN 439 (L) tree.

This species is new for Celebes; it was not collected, before, more eastward than Borneo.

Scurrula parasitica LINN., cfr. Bull. Jard. Bot. Buitenz., ser. 3, 11, p. 434 (1931) sub *Sc. fusca.*

Island Banggai, Febr. 1920, W. KAUDERN 509 (L) parasite on a pompelmoose tree.

Ginalloa arnottiana KORTH.; cfr. Bull. Jard. Bot. Buitenz., ser. 3, 11, p. 449 (1931).

Island Banggai, Febr. 1920, W. KAUDERN 508 (L) parasite on a pompelmoose tree.

New for Celebes proper, though known from Karakélang and Salajar.

12. New Clemens-numbers from Mt. Kinabalu, Borneo.

Lepeostegeres centiflorus (STAPF) VAN TIEGHEM — *31995*, 10 III 1933, Penibukan, W. Canon, 4000 ft, „flower pink"; *33785*, 29 VI 1933, Colombon River, 7000 ft, „red bracts, flower tube pale yellow-green, anthers blood-red, tips cells yellow, fruit red".

Macrosolen floridus DANSER — *30993*, 16 I 1933, Penibukan, 4—5000 ft, near Table Rock, N. Ridge-top, mossy forest, „inflor. pink, frt. yellow"; *32517*, 5 IV 1933, Marai Parai spur, 5—6000 ft, „fruit light orange".

Macrosolen splendidus DANSER — *30359*, 9 IX 1933, Penibukan, 4000 ft, „flower scarlet with black and white tips"; *31728*, 2 III 1933, Kina Taki River, 8000 ft, „fruit bright red".

Elytranthe albida (BLUME) BLUME — *32209*, 17 III 1933, Canon W. of Penibukan, 4000 ft.

Helixanthera cylindrica (JACK) DANSER — *32622*, 6 IV 1933, Marai Parai, 6—7000 ft.

Helixanthera maxwelliana (GIBBS) DANSER — *30923*, 10 I 1933, Penibukan, 4—5000 ft, top Table Rock, ridge left above camp, „fl. bright red".

Dendrophthoë quadrifida DANSER, n. sp. — Cfr. iconem (Fig. 1, *c—e*) — Ramuli foliaque novissima tantum tomentosa, mox omnino

glabra; inflorescentiae et flores tomento denso sed tenui subferrugineo in corollis tenuescente vestiti. Caules erecti; internodia foliifera teretia plerumque 1—3 cm longa 1.5—2.5 mm crassa, insertionibus foliorum valde incrassatis. Folia sparsa vel passim subopposita; petiolus teres, laminam versus supra subtusque vix applanatus, 3—8 mm longus; lamina obovata ad obovato-lanceolata, basi cuneata apice rotundata, 2—6 cm longa, 0.8—3 cm lata, crassiuscula vel crassa, rigida, faciebus vix diversis opacis, penninervis, costa basin versus utrinque prominente, nervis lateralibus primariis utrinque visibilibus, facie superiore paulo distinctoribus quam facie inferiore. Inflorescentiae racemi breves axillares erecti paribus florum 1—3, plerumque 2, decussatis; pedunculus plerumque 2—7 mm longus; axis florifer 0—14 mm longus, nodis applanatis; pedicelli 1—3 mm longi; bractea late ovata amplexicaulis, acutiuscula, c. 1.5 mm longa. Calycis tubus subcylindraceus, c. 2 mm longus et latus, limbus erectus integer c. 1 mm longus; corolla regularis statu alabastri adulti 26—28 mm longa, a basi rotundata paululum dilatata, 3 mm lata, teres vel plicis 4 longitudinalibus ad circiter duas terias longitudinis, ibi annulo paulo magis dilatato, supra annulum abruptius in collum 1.5 mm crassum contracta, deinde in clavam apicalem 1.75—2 mm crassam 4-angulam obtusam incrassata, postea fissa ultra dimidiam longitudinem in lacinias 4 circiter 100 mm ab apice subabrupte dilatatas, supra dilatationem anguste spathulatas crassiusculas acutiusculas 1—1.25 mm latas; filamenti pars libera 5 mm longa valde applanata; anthera 4 mm longa filamento vix latior obtusissima, 4-locularis (non septata); stilus corolla vix longior, a basi ad apicem subaequicrassus, 4-angularis, in 4 mm superioribus paulo tenuior, sub stigmate 8-costulatus; stigma capitatum stilo duplo crassius, c. 0.6 mm crassum. Fructus ignotus.

On first sight much like a mountain summit form of a long-flowered *D. pentandra* by the erect twigs, leaves and inflorescences and the rigidity of all parts. The 4-merous flowers with deeply split corollas induced me to distinguish it as a new species.

33035, 30 IV 1933, Marai Parai spur, 5000 ft, „flower red with yellow throat"; *32743*, 13 IV 1933, ridge below Marai Parai, 4000 ft, „flower red", type.

Scurrula parasitica LINN. — *28062*, 27 I 1932, Tenompok, 5000 ft, „buds brown, frt. brownish green"; *32996*, 27 IV 1933, Marai Parai,

Fig. 1 — a–b: *Taxillus sericus*, after the type FORREST 9470; a: flowerbearing twig, $^2/_3\times$; b: corolla with stamens and style, $2\times$; c–e: *Dendrophthoë quadrifida*, after the type CLEMENS 32743; c: flower-bearing twig, $^2/_3\times$; d: flower without corolla and stamens, $2\times$; e: corolla with stamens and style, $2\times$.


b
a
e
c
d

spur S. Sadikan River, 5000 ft, „flower, inflorescence and under leaf bright rusty brown".

Ginalloa arnottiana KORTHALS — *31779*, 23 II 1933, Upper Kina Taki river, 7000 ft.

Ginalloa nuda DANSER — *32078*, 11 III 1933, Penibukan, below camp, 4000 ft, „fruit bright red".

These materials, being much better than the type, allow to improve the description of the leaves of this curious species. They are not spathulate but *lanceolate, 25—35 mm long, 3—7.5 mm broad, subobtuse.* The well-developed pairs of leaves occur here and there at rather long intervals, and between them and the pairs reduced to a rim I did not find intermediary stages.

13. The Loranthaceae collected by George Forrest in Yunnan and adjacent regions.

Through the kindness of Prof. W. W. SMITH, Regius Keeper of the Herbarium of the Edinburgh Botanic Garden, I had the opportunity to revise the Asiatic *Loranthaceae* of that Herbarium, especially interesting by containing a complete set of the *Loranthaceae* collected by GEORGE FORREST in Yunnan and adjacent regions, for the greater part not yet, or only provisorily, named and affording many new and interesting taxonomic and floristic data. While giving a short account of my determinations of FORREST's *Loranthaceae* I take the opportunity to give also some remarks on few other specimens of the Edinburgh Herbarium collected in the same regions.

Macrosolen cochinchinensis (LOUREIRO) VAN TIEGHEM, Bull. Soc. Bot. Fr., 41 (1894) 122; *Loranthus cochinchinensis* LOUREIRO, Fl. cochinch., 1 (1790) 195. — N. E. Upper Burma, around Bhamo, Lat. 24°20′ N., alt. 400 ft, IV 1917, FORREST 13619 (flowers red an green; cfr. Not. Bot. Gard. Edinb., 17, p. 6); hills around Tzi-tzo-ti, Lat. 25°58′ N., Long. 98°29′ E., alt. 7.000 ft, V 1925, FORREST 26614 (flowers orange, on conifers and *Quercus*). — China, Yunnan, flanks of the Mingkwong valley, Lat. 25°15′ N., alt. 6—7.000 ft, V 1912, FORREST 7940 (flowers ruddy orange-yellow); N.W. of Tengyueh, Lat. 25°10′N., alt. 7—8.000 ft, VI 1912 FORREST 8231 (flowers yellowish-rose); *ibidem*, alt. 6.000 ft, VII 1913, FORREST 11840 (flowers pale-rose); *ibidem,* Lat. 25°30′ N., Long. 98°25′E., alt. 8.000 ft, V 1931, FORREST 29605 (flowers yellow, on conifers); Tengyueh valley, Lat. 25° N., alt. 5300 ft, VI 1931, FORREST 29723 (flowers crimson, fruits yellow); divide between Shweli

and Tengyueh valleys, Lat. 25° N., alt. 7.000 ft, VII 1912, FORREST 8810 (on oaks and pines, fruits bright orange); Shweli valley, Lat. 25°20′ N., alt. 7.000 ft, VIII 1913, FORREST 12052 (flowers dull yellowish-crimson); western flank of Shweli-Salwin divide, Lat. 25°45′ N., alt. 9—10.000 ft, V 1919, FORREST 17921 (flowers deep orange-yellow; cfr. Not. Bot. Gard. Edinb., 17, p. 297); Shweli-Salwin divide, Lat. 25°40′ N., alt. 8.000 ft, VI 1919, FORREST 18109 (fruits orange-yellow; cfr. Not. Bot. Gard. Edinb., 17, p. 312).

With exception of the first number, all the above specimens belong to the same particular form of the widely spread and polymorphic *M. cochinchinensis,* characterised by more robust inflorescences and somewhat thickish corollas. To the same form also belong HENRY 11755A and 11755B from Szemao, Yunnan, in the Edinburgh Herbarium. Everyone who is acquainted with the polymorphy of this species will understand that it is useless to distinguish local forms as varieties, that hardly, or not at all, can be fixed by descriptions. Also LECOMTE's varieties *puberula, Harmandii* and *tonkinensis* of his *Loranthus globosus* (cfr. Not. Syst., 3, p. 98—99), hardly deserve, after my opinion, to be named. FORREST 13619 and ROCK 2683, from S. Yunnan, between Keng Hung and Muang Hing, represent the form common in the Malay Archipelago.

Macrosolen Robinsonii (GAMBLE) DANSER, in Bull. Jard. Bot. Buitenz., ser. III, 10, p. 345 (1929); *Elytranthe Robinsonii* GAMBLE, in Kew Bull. (1913) 45. — China, Yunnan, Shweli-Salwin divide, Lat. 25°30′N., alt. 10.000 ft, VIII 1917, FORREST 15709 (shrub of 2—3 ft, parasitic on oaks and pines, flowers deep crimson and green; cfr. Not. Bot. Gard. Edinb., 17, p. 154).

This species was only known from Gunong Tahan in the Malay Peninsula, where it has been collected few times at altitudes of between 3.000 and 5.000 ft. FORREST's specimen differs from those from Gunong Tahan by unimportant characters certainly insufficient for specific distinction, *viz.* somewhat longer corollas (13—15 instead of 11—13 mm long), inflorescences not only on the leafless nodes but even for the greater part in the axils of the leaves and usually 2-flowered instead of usually 4-flowered.

Elytranthe albida (BLUME) BLUME, in SCHULTES, Systema veg., VII, 2, p. 1611 (1830); *Loranthus albidus* BLUME, in Verh. Bat. Genootsch., 9, p. 184 (1823). — China, Yunnan, Shweli-Salwin divide, Lat. 25° N., alt. 7—8.000 ft, V 1919, FORREST 17909 (shrub of 2—3 ft, flowers deep crimson, orange and red tipped; cfr. Not. Bot. Gard. Edinb., 17, p. 206; *ibidem,* 24°50′ N., alt. 7—8.000 ft, VIII 1919,

FORREST 18432 (shrub of 1—3 ft, flowers fleshy deep crimson, green tipped, parasitic on oaks and pines; cfr. Not. Bot. Gard. Edinb., 17, p. 337).

In the Edinburgh Herbarium there is also a specimen of HENRY 11604A, from Yunnan, Szemao, on which LECOMTE based *Elytranthe Henryi*, but neither FORREST's plants, nor HENRY's, nor KING's *Loranthus Collettii* from the Shan Hills, nor MERRILL's *Elytranthe Petelotii* from Indo China, nor MOORE's *Loranthus dranensis* from Siam, can be separated from BLUME's *Elytranthe albida*, originally described from Java, but widely spread and strongly varying in the western part of the Malay Archipelago inclusive the Malay Peninsula, and already recorded by J. D. HOOKER from the Khasia Hills.

Helixanthera parasitica LOUREIRO, Fl. cochinchin., 1 (1790) 142. — China, Yunnan, Shweli valley S. of Tengyueh, Lat. 24°42′ N., alt. 5—6.000 ft, II 1918, FORREST 16148 (flowers bright rose, anthers creamy yellow; cfr. Not. Bot. Gard. Edinb., 17, p. 178); 3 days S. of Tengyueh, Lat. 24°20′N., Long. 98°33′E., alt. 5—6.000 ft, V 1925, FORREST 26391 (flowers purple-rose, anthers yellow).

Helixanthera scoriarum (W. W. SMITH) DANSER, Bull. Jard. Bot. Buitenz., ser. III, 10, p. 318 (1929); *Loranthus scorarium* W. W. SMITH, in Not. Bot. Gard. Edinb., 10, p. 184 (1917). — China, Yunnan, Tengyueh, Lat. 25° N., alt. 5.000 ft, V 1912, FORREST 7689 (type of *Loranthus scorarium* W. W. SMITH, shrub of 2—4 ft, flowers reddish-orange); Shweli-Salwin divide, Lat. 25°45′ N., Long. 98°40′ E., alt. 9—10.000 ft, VI 1924, FORREST 24428 (parasitic shrub of 3—4 ft, on oaks and conifers, flowers dull-crimson-based, slipped dull green).

This species is not yet known from other localities. The type specimen has corollas nearly 10 mm long, the second specimen is somewhat more robust in all parts and has corollas up to 12 and 13 mm long.

The genus **Hyphear** comprises a number of closely allied species that, after the most important specific differences mentioned in literature, may be arranged in the following synoptical key.

Spikes terminal on short leafy twigs. Flowers sessile.
  Plant dioecious.
    Flowers 6-merous . . . . **H. europaeum**
    Flowers 5-merous . . . . **H. Owatarii, H. Tanakae**
  Flowers hermaphrodite.
    Flowers 6-merous . . . . **H. Grewinkii**
    Flowers 5-merous . . . . **H. Lambertianum**
Spikes axillary. Flowers inserted in hollows of the axis, 6-merous.
  Flowers hermaphrodite . **H. odoratum, H. pseudo-odoratum, H. Hemsleyanum**
  Plant dioecious . . . . **H. Delavayi**

The difference between species with flowers sessile, in spikes terminal on short leafy twigs, and such with flowers inserted in hollows of the axis of lateral spikes, is striking. On this difference is based the distinction of the *Viscoidei* and *Odorati* by DE CANDOLLE (Prodr., 4, p. 294) and that of the sections *Euloranthus* and *Cyttarellus* by VAN TIEGHEM (Bull. Soc. Bot. Fr., 41, p. 535—536).

All other characters used for the distinction of the species are of little systematic value. The number of petals and stamens is, among *Loranthoideae,* nowhere sufficient for specific distinction, and especially in *Helixanthera* and allied genera it is of very little systematic value. Moreover the number of petals appears not to be constant in *Hyphear europaeum,* as its flowers are in general 6-merous, but partly 5- and even 4-merous. If *H. Tanakae* really differs from *H. europaeum* mainly by 5-merous flowers, the doubt is justified whether it is specifically different. The same can be said about the difference between *H. Lambertianum* and *H. Grewinkii. Hyphear Owatarii* is very inadequately described, and from the description we cannot state any difference with *H. Tanakae.*

Also it is questionable whether hermaphrodite *Hypheata* may be always regarded as specifically different from such with hermaphrodite flowers. The flowers of *H. europaeum* are not always described as dioecious, but often as polygamic-dioecious, and what I have seen of *H. Delavayi* suggests that the same might be the case with this species. Moreover it is always possible, that male specimens may be looked upon as hermaphrodite. Among the species described with axillary inflorescences, *H. Delavayi* is perhaps not specifically different from *H. odoratum,* and still less important are the differences given for the distinction of *H. pseudo-odoratum* and *H. Hemsleyanum. Hyphear pseudo-odoratum* is said to differ from *H. odoratum* mainly by pruinose twigs and somewhat smaller leaves and inflorescences, differences that certainly are entirely insufficient for distinction of species. Specimens with pruinose twigs I found also between the Yunnan specimens of *H. Delavayi,* and this peculiarity may be caused by the mode of preparing the specimens for the herbarium. *Hyphear Hemsleyanum,* indeed, is described as possessing hermaphrodite flowers, but these flowers are said to have a „stylus gracilis brevis", and we justly find such styles in the male specimens of *H. Delavayi.* It is therefore that, among the materials enumerated below, I did not distinguish more than 2 species. Cfr. also the remarks to these.

Hyphear Delavayi (VAN TIEGHEM) DANSER, in Bull. Jard. Bot.

Buitenzorg, ser. III, 10, p. 319 (1929); *Loranthus Delavayi* VAN TIEGHEM, in Bull. Soc. Bot. Fr., 41, p. 535 (1894). — China, Yunnan, south side of Chao Cheo valley, alt. 7.000 ft, III 1905, FORREST 540 (on oak); Shweli valley, Lat. 25° N., alt. 6.000 ft, II 1913, FORREST 9564 (flowers brownish-yellow); *ibidem,* FORREST 9642 (flowers dull brownish-orange); *ibidem,* FORREST 9643 (flowers dull-orange, anthers light yellow); Lichiang Range, Lat. 27°35′ N., alt. 10.000 ft, VI 1913, FORREST 10149 (on oak); Salwin valley, Lat. 28°10′N., alt. 7.000 ft, IX 1917, FORREST 16196 (flowers olive-brown, on oaks and pines; cfr. Not. Bot. Gard. Edinb., 17, p. 181).

Moreover I will mention the following specimens seen by me in the Edinburgh Herbarium; China, Yunnan, Mou-gni-chan, près de Tapin-tze, 1800 m alt., 20 I 1887, DELAVAY 2312 (first no. cited by VAN TIEGHEM of his *Loranthus Delavayi*); bois de Mou-gni-chan, au-dessus de Pien-kio, 12 II 1888, DELAVAY 4653 (3rd no. cited by VAN TIEGHEM); Tibet, Tse-kou, 1800 m alt., 1912, MONBEIG s. n. (cfr. LECOMTE, Not. syst., 3, p. 196); China, Hupeh, HENRY 7849 (cfr. FORBES & HEMSLEY in Journ. Linn. Soc., bot., 26, p. 406); western Hupeh, WILSON 3524); Burma, S. Shan States, Loi Mwe, 5.000 ft alt., MACGREROR 86.

Of these specimens FORREST 16196 and MONBEIG s. n. are distinctly female, as styles and stigmas are strongly developed and anthers are entirely absent. Very probably male are those specimens of which the anthers are well-developed and the styles thin and attenuate towards the tip, that hardly bears a stigma, viz. FORREST 9564, 9642, 9643, DELAVAY 2312, 4635, HENRY 7849, WILSON 3524, MACGREGOR 86. The number FORREST 10149 is fruit-bearing; FORREST 540 is apparently hermaphrodite, as anthers are well-developed and the style is cylindrical and bears a well-developed stigma, though less clavate than in the female specimens cited. According to the key given in the above this specimen ought to be named *H. odoratum,* but as I cannot see any further differences with undoubtedly correctly named *H. Delavayi,* I give this specimen the same name.

Hyphear europaeum (JACQUIN) DANSER, in Bull. Jard. Bot. Buitenzorg, ser. III, 10, p. 319 (1929); *Loranthus europaeus* JACQUIN, Enum. stirp. Vindob., p. 230 (1762). — China, N.W. Yunnan, Mekong, Yangtze divide, around Wei Hsi, Lat. 27°12′ N., Long. 99°18′ E., alt. 9—10.000 ft, X 1921, FORREST 20953 (fruits clear transparent yellow, on *Quercus,* cfr. Not. Bot. Gard. Edinb., 14, p. 216).

The specimen is in fruit and only few leaves are present between the fruit sticking together. Though I cannot see whether the flowers

have been 5- or 6-merous, nor whether the flowers have been female or hermaphrodite, it is so much like a fruit-bearing specimen of *H. europaeum* that I see no reason to give it another name. The specimen ROCK 14750, from S.W. Kansu, lower Tebbu country, in Mayaku, alt. 7500 ft (in the Edinburgh Herbarium) appears to be wholly identical. Cfr. the remarks above.

Scurrula elata (EDGEWORTH) DANSER, in Bull. Jard. Bot. Buitenz., ser. III, 10, p. 350 (1929); *Loranthus elatus* EDGEWORTH, Transact. Linn. Soc., 20, p. 58 (1846). — China, Yunnan, western flank of the Shweli-Salwin divide, Lat. 25°20′ N., alt. 8—10.000 ft, VIII 1912, FORREST 8906 (flowers orange-red, shaded to dull sage at apex, stamens crimson, on oaks and pines).

This species is widely spread in the Himalayas. The locality where FORREST collected it probably is the most eastern known hitherto.

Scurrula ferruginea (JACK) DANSER, in Bull. Jard. Bot. Buitenz., ser. III, 10, p. 350 (1929); *Loranthus ferrugineus* JACK, in Mal. Misc., 1, p. 279, t. 59 (1820). — China, Yunnan, Shweli valley, Lat. 25° N., alt. 7.000 ft, II 1913, FORREST 9685 (flowers brown).

Scurrula ferruginea is common in the adjacent part of Burma and more southward, but I do not know more northern localities.

Scurrula gracilifolia (SCHULTES) DANSER, nov. comb.; *Loranthus gracilifolius* SCHULTES, Syst. veg., VII, 1, p. 99 (1829); *Loranthus graciliflorus* D. C., Prodr., 4, p. 300 (1830); *Loranthus chinensis* BENTH., Fl. hongkong., p. 141 (1861); an D. C., Mém. Lor., p. 28, t. 7 (1830) et Prodr., 4, p. 301 (1830)?; *Loranthus Scurrula* var. *graciliflorus* KURZ, For. Fl. Burma, 2, p. 319 (1877); HOOK.F., Fl. Br. Ind., 5, p. 209 (1886).

China, Yunnan, Shweli valley, Lat. 25° N., alt. 6.000 ft, VIII 1912, FORREST 8857 (base of tube of perianth ochre yellow shaded to green at apex, filaments deep crimson, anthers orange, on pines); Yung-pe Mts., Lat. 26°45′ N., alt. 10.000 ft, IX 1913, FORREST 11086 (flowers base exterior grey-orange, apex grey-green, interior dull green, on pines); Shweli-Salwin divide, Lat. 25°30′ N., alt. 9—10.000 ft, VIII 1918, FORREST 17534 (flowers greyish-red, on pines; cfr. Bot. Gard. Edinb., 17, p. 270).

A peculiar *Scurrula*, closely allied to the polymorphic and widely spread *Sc. parasitica*, but probably specifically as distinct as the other *Scurrulae* and strikingly different by entirely glabrous foliage only tomentose in the very young state, and very slender flower-buds and flowers.

Entirely the same form is represented by the numbers LACE 5373

and 5417, both from Burma, Maymyo, 3400—3500 ft alt., in the Edinburgh Herbarium; apparently the same species, though with smaller leaves, is the number EM. BODINIER 792, from Hongkong, in the same herbarium. Probably also the following specimens without flowers: FORREST 526, without exact locality, and FORREST 9299, from Yunnan, N. of Tengyueh, Lat. 25°15′ N., alt. 8.000 ft, XI 1912.

Scurrula philippensis (CHAM. & SCHLECHT.) G. DON, Gen. Hist. Dichl. Pl., 3, p. 422 (1834); *Loranthus philippensis* CHAM. & SCHL., in Linnaea, 3, p. 204 (1828). — China, Yunnan, Shweli valley, Lat. 25° N., alt. 6.000 ft, VII 1912, FORREST 8665 (exterior of perianth bright brown at base shading green towards apex, limb green, filaments red or red-orange, anthers yellow, on oak and pine); mountains N.E. of the Yangtze bend, Lat. 27°45′ N., alt. 10—11.000 ft, VIII 1913, FORREST 10928 (flowers dull soft orange at base, shaded to dull olive green at apex, interior deep maroon, on pines and *Salix*); Tale Range, Lat. 25°40′N., alt. 10.000 ft, IX 1913, FORREST 11633 (flowers interior maroon, exterior dull grey, on pines) and VII, 1913, FORREST 11650 (flowers interior deep crimson-maroon, exterior grey towards apex, with dull orange base, on *Salix* and pines); N'Maikha-Salwin divide, Lat. 26°20′ N., alt. 9.000 ft, VI 1919, FORREST 18062 (flower tube dull brownish-grey, petals green, on pines and oaks; cfr. Not. Bot. Gard. Edinb., 17, p. 308).

I cannot distinguish this from the Philippine *Sc. philippensis*, but probably it is conspecific with *Sc. cordifolia* (WALL.) G. DON, a species I do not know sufficiently.

Taxillus Delavayi (VAN TIEGHEM) DANSER, in Verh. Akad. Wetensch. Amsterd., afd. Natuurk., sect. 2, 29, 6, p. 123 (1933); *Phyllodesmis Delavayi* VAN TIEGHEM, in Bull. Soc. Bot. Fr., 42, p. 265 (1895); *Loranthus Delavayi* ENGLER, in ENGL. & PR., Nat. Pflanzenfam., Nachtr., p. 131 (1897) non VAN TIEGHEM (1894); *Loranthus Balfourianus* DIELS, in Not. Bot. Gard. Edinb., 5, p. 250 (1912). — E. Upper Burma, western flank of the Chimi-li, N'Maikha-Salwin divide, Lat. 26°21′ N., Long. 98°48′ E., alt. 9.000 ft, VI 1924, FORREST 24595 (flowers flame-crimson, tipped green, on conifers and poplars); N.E. Burma, side valleys on the N'Maikha-Salwin divide, Lat. 26°20′ N., alt. 8—9.000 ft, VI 1931, FORREST 29752 (flowers orange-crimson, tipped green). — China, Tibet banks of the Mekong between Bati and Tsekou, alt. 6.000 ft, 1904, FORREST 543 (first type of *Loranthus Balfourianus* DIELS); Yunnan, eastern flank of the Lichiang Range, Lat. 27°10′ N., alt. 10.000 ft, V 1906, FORREST 2215 (flowers orange-crimson, fruit yellow, mostly on *Prunus* and *Salix*, second type of *Loranthus Balfourianus* DIELS); *ibidem*,

alt. 9—10.500 ft, V 1910, FORREST 5622 (tube of corolla crimson, limb green, on pines, *Rosaceae* and *Tiliaceae*) ; N. of Tengyueh, Lat. 25°15′ N., alt. 7.000 ft, V 1912, FORREST 7718 (flowers deep flame red, with limb of corolla green, on pines and other trees) ; mountains in the N.E. of the Yangtze bend, Lat. 27°45′ N., alt. 10.000 ft, VII 1913, FORREST 10579 (on pines, fruits scarlet).

This species is widely spread and common in eastern China, and apparently also occurs in the adjacent art of Upper Burma. The number DELAVAY 2620, on which VAN TIEGHEM based his *Phyllodesmis Delavayi* and of which I saw a specimen in the Edinburgh Herbarium, is identical with the numbers FORREST 543 & 2215, on which DIELS based his *Loranthus Balfourianus*; in the genus *Taxillus* the species name *Delavayi* has priority over that of *Balfourianus*.

Taxillus Kaempferi (DE CANDOLLE) DANSER, in Verh. Kon. Akad. Wetensch. Amsterd., afd. Natuurk., sect. 2, 29, 6, p. 124 (1933) ; *Viscum Kaempferi* D. C., Prodr., 4, p. 285 (1830) ; *Loranthus caloreas* DIELS, in Not. Bot. Gard. Edinb., 5, p. 251 (1912). — China, Yunnan, eastern flank of the Lichiang Range, Lat. 27°15′ N., alt. 9—11.000 ft, VII 1906, FORREST 2600 (flowers bright scarlet, limb of perianth bright green, on conifers only, type of *Loranthus caloreas* DIELS) ; *ibidem,* Lat. 27°30′ N., alt. 10—11.000 ft, VII 1910, FORREST 6147 (flowers crimson and green, fruit yellow, on conifers) ; mountains in the N.E. of the Yangtze bend, Lat. 27°45′ N., alt. 10—11.000 ft, VIII 1913, FORREST 10760 (flowers orange-red tipped deep olive green, on conifers especially *Tsuga*) ; Tali Range, Lat. 25°40′ N., alt. 10.000 ft, VI 1913, FORREST 11663 (flowers red-orange and maroon, on pines) ; Lichiang Range, Lat. 27° N., alt. 11.000 ft, VII 1918, FORREST 16310 (fruits red-orange, parasitic on conifers; cfr. Not. Bot. Gard. Edinb., 17, p. 189) ; Shweli-Salwin divide, Lat. 25°40′ N., alt. 7—8.000 ft, VI 1919, FORREST 18072 (flowers green, on pines and other trees; cfr. Not. Bot. Gard. Edinb., 17, p. 309).

Somewhat doubtful by broader leaves, and with unripe fruit only: Yangtze valley between Chu Ṭim and Shih Ku, alt. 6—7.000 ft, 1904, FORREST 614 (on oak).

I cannot distinguish *Loranthus caloreas* DIELS from the Japanese *Taxillus Kaempferi* otherwise than by larger flowers, more robust vegetative parts and very young parts covered with ferrugineous indumentum but soon becoming glabrous. The corollas of the Japanese plant are, as far as known to me, 14—15 mm long; the type of *Loranthus caloreas* has corollas extremely long, viz. 28—32 mm, but in the Edinburgh Herbarium the other specimens of the latter species show a rather strong

variability of the corolla length, down to 25 mm, whereas there is one specimen from southern Chekiang (CHING 2402) agreeing with *Loranthus caloreas* by rusty-hairy young parts, but with corollas only 11—12 mm long.

The species also occurs west of the Chinese border, as show the following specimens in the Edinburgh Herbarium: Bhutan, Chalimarphé, Timpu, alt. 7.000 ft, 8 VII 1914, R. E. COOPER no. 1398 (on *Pinus*), and Bhutan, Paro, alt. 9.000 ft, 7 XI 1914, R. E. COOPER no. 3567 (on *Pinus*).

Taxillus sericus DANSER, n. sp. — Cfr. iconem (Fig. 1, *a*—*b*) — Partes iuveniles pilis stellatis tenuiter sed dense vestitae, ramuli foliaque mox glabra, pedicelli prope apicem, bracteae et calyces omnino indumento usque ad tempus florendi persistente, corolla dum aperta iam glabrescens. Ramuli teretes, novissimi sub nodis paulum angulati, rugulosi, nec opaci, nec lucidi, vetustiores opaci, nodis incrassatis. Folia sparsa vel subopposita; petiolus basi teres, laminam versus subtus rotundatus supra applanatus vel leviter canaliculatus, 10—17 mm longus; lamina oblonga vel ovato-oblonga, 6—10 cm longa, 2.5—4 cm lata, sub basi cuneata in petiolum contracta, margine saepe irrugulari, apice obtusiusculo, tenuiter coriacea, facie superiore sublucida inferiore opaca, penninervis nervis usque ad venas utrinque visibilibus facie inferiore prominulis. Inflorescentiae paulatim in axillis vel gregatim in nodis vetustioribus, umbellae pedunculatae floribus plerumque 4; pedunculus teres 3—5 mm longus, basi apiceque incrassatus 0.75 mm crassus, medio 0.3—0.6 mm crassus, paribus florum 2 decussatis; pedicelli pedunculo aequilongi vel paulo longiores, ad 0.2 mm crassi; bractea ovata basi annulo angusto calycis basin amplectens, obtusa, 0.75—1 mm longa. Calyx campanulato-infundibuliformis, 2—2.5 mm longus, apice circiter 1.5 mm latus, limbo subnullo; corolla statu alabastri adulti ad 30 mm longa, supra basin mox inflata ad 3 mm lata, supra medium gradatim angustata, ad 6—7 mm ab apice in collum 1—2 mm crassum angustata, supra collum in clavam apicalem oblongam obtusissimam 1.5—2.5 mm crassam incrassata, postea divisa in lacinias 4 secundas 8—9 mm longas parte superiore 5 mm longa reflexa 1 mm lata lanceolato-spathulata, fissura singula ultra medium corollae longitudinis producta; anthera 5 mm longa, sessilis, obtusissima, loculis 4 distinctis non septatis; stilus 30 vel 31 mm longus, filiformis, c. 0.2 mm crassus, parte inferiore 4-angularis; stigma globosum, c. 0.4 mm crassum. Fructus ignotus.

China, Yunnan, western flank of the Shweli-Salwin divide, Lat. 25°20′ N., alt. 9.000 ft, XII 1912, FORREST 9470 (parasitic shrub of 2 ft, on pines, base of corolla deep orange, exterior of upper portion deep

green, interior dark maroon; type); S. of Tengyueh, Lat. 25°, alt. 6.000 ft, II 1913, Forrest 9622 (parasitic shrub of 2—3 ft, flowers red and green); Sikkim, Burmiak, alt. 4.000 ft, 1 XII 1908, W. G. Craib 458.

Taxillus sericus is a peculiar intermediate between the aberrant *T. Delavayi* and some more normal, *Scurrula*-like species, like *T. yadoriki.* Whereas *T. Delavayi* is peculiar by angular, shining, somewhat umbellately branched twigs, strongly attenuate indistinctly petioled leaves hardly different above and beneath, sessile nearly glabrous inflorescences often surrounded by a few-leaved rosette, and a distinct calyx limb, these peculiarities are only partly found in *T. sericus.* Here the angles of the twigs are hardly developed and the twigs are not or little shining; the subumbellate branching is never distinct; the leaves are rather strongly attenuate at the base, but more distinctly petioled and somewhat shining above; the inflorescences are peduncled and never bear leaf-rosettes at their base; the apical part of the pedicels, the bracts and the calyces are sparingly but distinctly hairy; the calyx limb is almost none, the corolla is nearly as in *T. Delavayi.* It would not at all look impossible that *T. sericus* were a species hybrid, if the anthers were not nearly sessile. Though the length of the filaments is variable in *T. Delavayi* as well as in *T. yadoriki* and its allies, I never met with a specimen with sessile anthers.

These remarks mainly bear on the type specimen Forrest 9470; the other specimens are little different but the anthers are broken off in the well-developed flowers. The specimen Forrest 9622 is somewhat smaller in all parts and the corollas are only 20 mm long; its bears fruit somewhat better developed, slightly scrobiculate or very superficially warty. The third specimen, Craib 458, bears longer flowers with corollas nearly 35 mm long and their tube less inflated; the inflorescences are slightly coarser, their peduncles only 2 mm long, their indumentum less sparse. In spite of its being found so far from the other specimens the resemblance is striking.

Taxillus thibetensis (Lecomte) Danser, in Bull. Jard. Bot. Buitenz., ser. III, 10, p. 355 (1929); *Loranthus Duclouxii* & *L. thibetensis* Lecomte, Not. syst., 3, p. 166, 168 (1915). — China, Yunnan, N.E. of the Yangtze bend, Lat. 27°45′ N., alt. 11.000 ft, VII 1913, Forrest 10342 (flowers dull green, anthers orange, on pines and ever-green oaks); on the Li-ti-ping, Lat. 27°12′ N., alt. 9.000 ft, VI 1917, Forrest 13882 (flowers red-orange and green, on oaks; cfr. Not. Bot. Gard. Edinb., 17, p. 25); Mekong divide, Lat. 26°40′ N., Long. 99°40′ E., alt. 9—11.000 ft, VIII 1922, Forrest 23085 (flowers exterior greyish interior deep maroon, on

various conifers and *Pyrus*; cfr. Not. Bot. Gard. Edinb., 14, p. 377).

The same species is represented by several other specimens in the Edinburgh Herbarium, all of them from China: Thibet Oriental, Tsekou, VI 1895, SOULIÉ s. n. (double of the Muséum d'Histoire Naturelle, Paris, labelled there as *Loranthus thibetensis* LEC. and identical with the type SOULIÉ 1340 and with SOULIÉ s. n. in the Herbarium of the Muséum d'Histoire Naturelle at Paris); Yunnan, vicinity of Yun-nan-sen, MAIRE 1917; Yunnan, plaine de Kiao-kia, alt. 400 m, MAIRE s. n.; Kiao-kia, 14 II 1909, DUCLOUX 1277 coll. S. TEN; prope urbem Yünnanfu, 1800—2200 m alt., 27 IV 1915, HANDEL-MAZZETTI 1601; inter Yung peh ad flumen Yangtze, 2300 m alt., 3 VII 1914, SCHNEIDER 1725; Szechuan australis, inter Woholo & Choso, 2800 m alt., 15 VI 1914, SCHNEIDER 1576.

The type of *Loranthus Ducloux*ii LECOMTE (DUCLOUX 6272) I saw in the Paris Herbarium; it shows hardly any difference with the specimens labelled as *Loranthus thibetensis* by LECOMTE himself.

Taxillus vestitus (WALLICH) DANSER, in Bull. Jard. Bot. Buitenz., ser. III, 10, p. 355 (1929); *Loranthus vestitus* WALLICH, in ROXB., Fl. ind., ed. 1, II, p. 218 (1824). — China, banks of the Yangtze between Chu Tim and Shi Ku, 6—7.000 ft alt., 1904, FORREST 524 (on evergreen oak); Mekong valley, Lat. 27°40′ N., alt. 9.000 ft, VII 1914, FORREST 12935 (on oaks); Chungtien plateau, Lat. 27°40′ N., alt. 11.000 ft, VI 1917, FORREST 13879 (on pines and *Salix*; cfr. Not. Bot. Gard. Edinb., 17, p. 25).

This species is spread westward all over the Himalayas to Punjab, and appears to reach its eastern frontier in Yunnan. Cfr. the remark on its relationships below.

As among FORREST's specimens the closely allied species *T. thibetensis* and *T. vestitus* appear to occur, I should like to make some remarks about the difference between these two species and their nearest allies *T. yadoriki, T. sutchuenensis* and *T. Cavaleriei.*

Taxillus yadoriki (MAXIM.) DANSER, in Bull. Jard. Bot. Buitenz., ser. III, 11, p. 445 (1931); *Loranthus Yadoriki* MAXIMOWICZ, Bull. Ac. Sc. St. Petersb., 22, sep. p. 609 (1876), is so closely allied to *T. thibetensis* and to *T. vestitus* that it looks not at all impossible that these 3 species might be geographic variations of one widely spread polymorphic species. It is not at all easy to indicate exact differences.

Taxillus vestitus is peculiar by thickly coriaceous, obovate-oblong leaves, that are soon glabrous and shining above, densely tomentose beneath like the petioles and twigs, by short flowers (the corolla 12—14 mm long), and abundantly developed oblong fruit that have a

granulate surface and are nearly sessile by 2 or 3 on the tip of a short and thick peduncle (usually 1—2 mm long).

Taxillus yadoriki on the contrary has roundish leaves with a less thick, darker-coloured and finally less copious tomentum, pedicels longer than the peduncle (viz. 3—4 mm long) and longer flowers (corolla 20—25 mm long).

Taxillus thibetensis shows more resemblance with *T. yadoriki* than with *T. vestitus,* but in general it is somewhat more robust than the former and its tomentum is denser and more light-coloured, the peduncles are shorter (1—2 mm long or even shorter), the pedicels variable in length (1—5 mm), the flowers larger (corolla 22—32 mm long), the calyx limb more distinct though very short, the flowers often 5-merous (SCHNEIDER 1725 appears entirely 5-merous, MAIRE s. n. and FORREST 23085 partly, the other specimens mentioned are 4-merous), the loculi of the anthers are often transversely septate (in *T. vestitus* and *T. yadoriki* the calyx limb is wellnigh none, the flower 4-merous, the loculi are not chambered).

Taxillus sutchuenensis (LECOMTE) DANSER, in Bull. Jard. Bot. Buitenz., ser. III, 10, p. 355 (1929); *Loranthus sutchuenensis* LECOMTE, in Not. syst., 3, p. 167 (1915), is also slightly different from the above mentioned species, and I would hardly believe it to be a distinct species if there were not, in the Edinburgh Herbarium, so many specimens that entirely agree with LECOMTE's plant. I have seen the type (FARGES 444) in the Paris Herbarium, of which FARGES s. n. in the Edinburgh Herbarium apparently is a double. The differences are the much scarcer indumentum, dense and light-ferrugineous on the young parts, soon disappearing on the twigs, the petioles and the upper surface of the leaves, but persistent, dense and thin on the undersides of the leaves and on the inflorescences, growing sparse on the corolla; moreover the more ellipsoidal calyx, the more slender corolla nearly 25 mm long and 4-merous, the flower-bud more acute, the loculi of the anthers distinctly septate. The following specimens evidently belong to it.

China, Su-tchuen Oriental, distr. de Tchen-kéou-tin, FARGES s. n., identical with FARGES 444 and FARGES s. n. in the Paris Herbarium; prov. du Kouy-Tchéou, environs de Gan-pin, He-chê-teou, 8 VIII 1897, MARTIN et BODINIER No. 1796; W. Hupeh, VI 1900 (?), WILSON 809; prov. Hupeh, 1885—1888, HENRY 2496 & 5902; Chirushih, 1888, HENRY 5902A; Changyang, 1888, HENRY 5902B; Si-teou-qoi, 28 VII 1902, LÉVEILLÉ 137 and without locality VIII 1904, ESQUIROL 175.

Taxillus Cavaleriei (LÉVEILLÉ) DANSER, n. comb. *Loranthus Cava-*

leriei LÉVEILLÉ, Cat. pl. Yunnan, p. 172, 1916), was quite obscure to me till I saw a specimen of the type number CAVALERIE 2660 in the Edinburgh Herbarium, from which was evident, that this species was a *Taxillus* most closely allied to those discussed above. Prof. W. W. SMITH kindly copied for me the original description that was inaccessible to me, and that runs as follows:

„(1) Loranthus Cavaleriei Lévl. nov. sp. Folia lanceolata valde coriacea obtusa nitida glaberrima petiolata, 3—4 mm; flores tetrameri; corolla gamopetala. Kouy-Tcheou: nord de Lo-Fou, Touan-Cha, nov. 1903 (J. Cavalerie 2660)."

This diagnose evidently being insufficient to recognise the species, I will give here a more complete description after the specimen in the Edinburgh Herbarium.

Taxillus Cavaleriei, descriptio emendata. — Ramuli teretes, nodis paulum tumidis, cano-fusci, iam inter folia lenticellis minutis numerosis, inter folia adulta 2.5—4 mm crassi, internodiis plerumque brevibus, rarius longioribus, 1—5 cm longis. Folia opposita; petiolus difficile a lamina distinguendus, 2—5 mm longus, subtus valde supra leviter convexus; lamina (probabiliter) oblonga ad ovato-lanceolata, ad 10 cm longa, 2—3.5 cm lata, sub basi rotundata vel cuneata in petiolum contracta, apice obtusa vel rotundata, crasse coriacea et fragilis, facie superiore lucidula, facie inferiore opaca, costa et nervis primariis supra magis (!) prominentibus quam subtus, nervis crassioribus supra indistinctis subtus invisibilibus, venis omnino invisibilibus. Pedunculus c. 2 mm longus, 0.75 mm crassus, apice paulum incrassatus vel dilatatus, cicatricibus florum 2 vel 3; pedicelli teretes, 2—3 mm longi, c. 0.3—0.4 mm crassi; bractea minima, c. 0.5 mm longa, forma indistincta. Calyx campanulatus, basi subtruncatus, 1.5 mm latus, apicem versus paulum attenuatus, limbo paulum dilatato, subintegro, brevissimo; corolla ad 30 mm longa, supra basin rotundatam c. 3 mm lata, deinde attenuata, in tertia parte longitudinis 1—1.5 mm lata, denique in clavam apicalem obtusissimam 2 mm crassam incrassata, postea divisa (altero latere vix profundius) in lacinias 4 anguste spathulatas crassiusculas acutiusculas, parte reflexa 5—6 mm longa 0.8—1 mm lata; filamenti pars libera 0.5—0.75 mm longa; anthera c. 4 mm longa, obtusissima, loculis 4 probabiliter septatis; stilus filiformis 4-angularis apicem versus vix attenuatus; stigma obovatum, obtusissimum. Fructus ignotus. Indumentum in partibus iuvenilibus tenue sed densum, cano-fuscum, stellatum, in partibus vegetativis mox evanescens, in inflorescentiis et calycibus persistens tenue, in corolla adulta parcum stellatum.

Taxillus Cavaleriei is most closely allied to *T. sutchuenensis,* but differs by more oblong, thicker and less distinctly nerved laminae, that are soon glabrous also below, shorter and less distinct petioles, slightly longer peduncles and pedicels, shorter filaments and longer anthers, and somewhat longer corollas.

A plant that very well agrees with the type is HENRY 10057, also from China, Yunnan, Szemao, 6500 ft alt., slightly different, however, by somewhat longer petioles, less narrow leaves with more distinct nervation and less shining upper surface, and more ellipsoidal calyx tube, and by these differences coming nearer to *T. sutchuenensis,* but more different from this species by longer corollas (35 mm) and longer pedicels (4—5 mm). It is very well possible that *T. Cavaleriei* is not specifically distinct from *T. sutchuenensis,* and perhaps as little from other allied species.

Arceuthobium chinense LECOMTE, Not. syst., 3, p. 170 (1915) — China, Yunnan, ♀, eastern flank of the Lichiang Range, Lat. 27°30′ N., alt. 12.000 ft, IX 1900, FORREST 6672 (plant of 1—4 inches, parasitic on *Pinus*); ♂, Lichiang Range, Lat. 27°35′ N., alt. 12.000 ft, VI 1913, FORREST 10169 (tufted plant of 4—9 inches, flowers olive green, parasitic on *Pinus*); ♂, Mekong-Salwin divide, Lat. 28°12′ N., alt. 10.000 ft, VII 1917, FORREST 14194 (shrub of 4—6 inches, flowers green, parasitic on *Pinus*; cfr. Not. Bot. Gard. Edinb., 17, p. 49); ♂, western flank of the Tali Range, Lat. 25°40′ N., alt. 12.000 ft, VII 1917, FORREST 15557 (plant of 1—2 inches, parasitic on conifers; cfr. Not. Bot. Gard. Edinb., 17, p. 144).

The type (DELAVAY s. n.) is also from Yunnan.

Korthalsella Opuntia (THUNB.) MERRILL, in Bot. Mag. Tokyo, 30, p. 68 (1916); *Viscum Opuntia* THUNB., Fl. jap., p. 64 (1784). — China, Yunnan, on the Karni Pass, Lat. 28° N., alt. 9.000 ft, VI 1917, FORREST 13918 (parasitic plant of 4—6 inches on oak; cfr. Not. Bot. Gard. Edinb., 17, p. 28).

Viscum album LINN., Sp. pl., ed. 1, 2, p. 1023 (1753). — China, Shweli-Salwin divide, Lat. 25°45′ N., Long. 98°58′ E., alt. 9.000 ft, XI 1924, FORREST 25388 (fruits pale green).

Viscum articulatum BURMAN FIL., Fl. ind., p. 211 (1768) — China, Yunnan, Sung Kwei valley, alt. 7.000 ft, 1904, FORREST 542; Lichiang Range, Lat. 27°40′ N., alt. 11.000 ft, VI 1913, FORREST 10174 (on pines); on the Tong Shan in the Yangtze bend, Lat. 27°20′N., alt. 9—10.000 ft, IX 1913, FORREST 11112 (on pines and oaks); *ibidem,* alt. 9.000 ft, VII 1914, FORREST 12719 (on pines and poplars); between Tan-tui and

Pungtzula, Lat. 28° N., alt. 10.000 ft, VI 1917, FORREST 13811 (stems orange-yellow, on oaks, cfr. Not. Bot. Gard. Edinb., 17, p. 20); on the descent from Lu-tien to the Yangtze, Lat. 27°12′ N., alt. 8.000 ft, XI 1917, FORREST 16142 (on *Alnus*, fruits greeny-white; cfr. Not. Bot. Gard. Edinb., 17, p. 177); Shweli-Salwin divide, Lat. 25°40′ N., alt. 10.000 ft, VII 1919, FORREST 18155 (fruit immature greenish-white, on pines and various other trees; cfr. Not. Bot. Gard. Edinb., 17, p. 316).

It is remarkable that FORREST never mentions the parasitism of this species on other *Loranthaceae*, which is the rule in the Malay Archipelago.

Index of herbarium numbers mentioned in this note. BODINIER 792 (*Sc. g.*), CAVALERIE 2660 (*T. C.*), CHING 2402 (*T. K.*), COOPER 1398 (*T. K.*), 3567 (*T. K.*), CRAIB 458 (*T. s.*), DELAVAY s. n. (*A. ch.*), 2312 (*H. D.*), 2620 (*T. D.*), 4653 (*H. D.*), DUCLOUX 1277 (*T. th.*), 6272 (*T. th.*), ESQUIROL 175 (*T. s.*), FARGES s. n. (*T. s.*), 444 (*T. s.*), FORREST 524 (*T. v.*), 526 (*Sc. g.*), 540 (*H. D.*), 542 (*V. ar.*), 543 (*T. D.*), 614 (*T. K.*), 2215 (*T. D.*), 2600 (*T. K.*), 5622 (*T. D.*), 6147 (*T. K.*), 6672 (*A. ch.*), 7689 (*H. sc.*), 7718 (*T. D.*), 7940 (*M. c.*), 8231 (*M. c.*), 8665 (*Sc. ph.*), 8810 (*M. c.*), 8857 (*Sc. g.*), 8906 (*Sc. e.*), 9299 (*Sc. g.*), 9470 (*T. s.*), 9564 (*H. D.*), 9622 (*T. s.*), 9642 (*H. D.*), 9643 (*H. D.*), 9685 (*Sc. f.*), 10149 (*H. D.*), 10169 (*A. ch.*), 10174 (*V. ar.*), 10342 (*T. th.*), 10579 (*T. D.*), 10760 (*T. K.*), 10928 (*Sc. ph.*), 11086 (*Sc. g.*), 11112 (*V. ar.*), 11633 (*Sc. ph.*), 11650 (*Sc. ph.*), 11663 (*T. K.*), 11840 (*M. c.*), 12052 (*M. c.*), 12719 (*V. ar.*), 12935 (*T. v.*), 13619 (*M. c.*), 13811 (*V. ar.*), 13879 (*T. v.*), 13882 (*T. th.*), 13918 (*K. O.*), 14194 (*A. ch.*), 15557 (*A. ch.*), 15709 (*M. R.*), 16142 (*V. ar.*), 16148 (*H. p.*), 16196 (*H. D.*), 16310 (*T. K.*), 17534 (*Sc. g.*), 17909 (*E. a.*), 17921 (*M. c.*), 18062 (*Sc. ph.*), 18072 (*T. K.*), 18109 (*M. c.*), 18155 (*V. ar.*), 18432 (*E. a.*), 20953 (*H. e.*), 23085 (*T. th.*), 24428 (*H. sc.*), 24595 (*T. D.*), 25388 (*V. al.*), 26391 (*H. p.*), 26614 (*M. c.*), 29605 (*M. c.*), 29723 (*M. c.*), 29752 (*T. D.*), HANDEL-MAZZETTI 1601 (*T. th.*), HENRY 2496 (*T. s.*), 5902 (*T. s.*), 5902A (*T. s.*), 5902B (T. s.), 7849 (*H. D.*), 10057 (*T. C.*), 11604A (*E. a.*), 11755A (*M. c.*), 11755B (*M. c.*), LACE 5373 (*Sc. g.*), 5417 (*Sc. g.*), LÉVEILLÉ 137 (*T. s.*), MAIRE s. n. (*T. th.*), 1917 (*T. th*), MARTIN & BODINIER 1796 (*T. s.*), MACGREGOR 86 (*H. D.*), MONBEIG s. n. (*H. D.*), ROCK 2683 (*M. c.*), 14750 (*H. e.*), SCHNEIDER 1576 (*T. th.*), 1725 (*T. th.*), SOULIÉ s. n. (*T. th.*), 1340 (*T. th.*), WILSON 809 (*T. s.*), 3524 (*H. D.*).

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14. **Lepeostegeres acutibracteus Danser, n. sp.** (Cfr. fig. 2).

Omnis glabra. Ramulus (unicus notus) robustus, internodiis levibus atrisque, 4.5—6.5 cm longis, terminali basi paulum applanato c. 4 mm crasso apicem versus magis applanato ancipite, abrupte in nodum sesquiplo latiorem dilatato, internodiis inferioribus magis teretibus crassioribus ad 5 mm crassis, nodis applanatis incrassatis ad 10 mm latis, vetustioribus ignotis. Folia opposita; petiolus 3—12 mm longus, 1.5—

3.5 mm crassus, basi paulum tantum incrassatus, facie inferiore rotundatus, facie superiore prope basin planiusculus, laminam versus magis applanatus; lamina ovata vel oblonga, 5—9 cm longa, 2—6 cm lata, basi rotundata vel breve cuneata, apice plerumque acuta, rarius obtusiuscula vel nonnihil acuminata, crasse coriacea et rigida, facie superiore lucida inferiore opaca, costa facie inferiore omnis prominente apicem versus valde attenuata, facie superiore plana parte basali tantum visibili, nervis ceteris fere omnino invisibilibus. Inflorescentiae capitatae singulae vel paucae in axillis foliorum, omnino sessiles; receptaculum breve et planum; involucri bracteae crasse coriaceae, parte apicali et media carinatae, facie exteriore tamquam ferrugine tectae, in paribus 5 decussatis imbricatis dispositae; bracteae paris primi parvae, pauca mm tantum longae, rotundato-ovatae vel subreniformes, parium secundi et tertii et quarti gradatim longiores, suborbiculares apice in acumen longiusculum obtusiusculum prolongatae, paris quinti sicut quarti, sed lateribus arcuatim excisis, eo subsagittatae (paris quarti nonnunquam excisione simili sed multo minore). Flores circiter 13 (in capitulo examinato scilicet 10 peripherici et 3 centrales), pedicellis vix diversis omnibus 1.5—2 mm longis apice c. 1 mm latis basin versus paulo angustioribus, pressione angulatis, exteriorum nonnullis apice bracteola forma variabili praeditis, ceteris bracteola nulla. Calyx pressione omnino prismaticus, tubo c. 2—2.5 mm longo 1.5 mm lato, limbo erecto c. 1 mm longo margine membranaceo irregulariter lacerato; corolla statu alabastri adulti 21—22 mm longa, parte inferiore cylindrica calycis limbo aequilata, parte media fusiformiter inflata, parte superiore 5 mm longa cylindrica c. 1.5 mm lata apice obtusissima, postea ultra medium divisa in lacinias 6 parte inferiore anguste triangula superiore anguste spathulata, parte apicali 2.5—3 mm longa acute reflexa c. 0.6 mm lata apice crassiuscula et

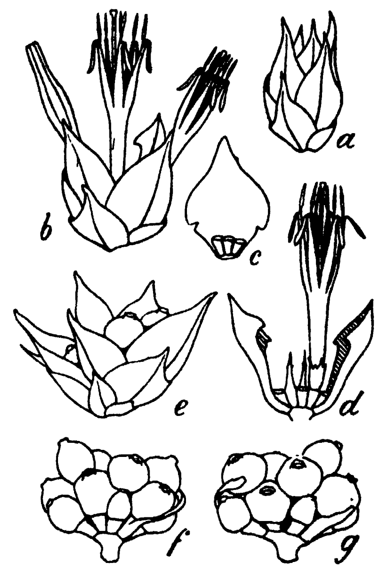

Fig. 2 — *Lepeostegeres acutibracteus* DANSER, n. sp.. *a*: inflorescence in bud; *b*: inflorescence in flower, with the flowers only part drawn, and with the outermost involucral bracts fallen off; *c*: involucral bract of the fourth pair, with three pedicels; *d*: receptacle with innermost involucral bracts, pedicels, bracteoles, and one flower; *e*: fruiting inflorescence: *f*—*g*: the same without involucre, seen from two opposite sides. All natural size.

obtusiuscula; filamenti pars libera c. 0.75 mm longa; anthera 2 mm longa, a basi ad apicem gradatim angustata, acuta; stylus corollae aequilongus, strictus, vix attenuatus, stigmate subgloboso c. sesquiplo crassiore. Fructus subglobosi, ad 6 mm diametro, calycis limbo et disco persistentibus coronatus sed styli rudimento nullo, pedicellis paulum auctis, 2—5 mm longis.

Differt ab omnibus congeneribus bracteis involucrantibus carinatis acuminatis, receptaculo et corolla brevibus, et filamenti parte libera brevissima.

Philippines, Busuanga Island, IX 1922, Bureau of Science 41187 leg. Ramos (one flowering and fruiting twig in the herbarium of the Museum of Natural History at Paris).

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15. Dicymanthes lombocana Danser, n. sp.

Robustior, glaberrima. Internodia foliifera teretia, 6—17 cm longa, 2—5 mm crassa, primum levia postea lenticellosa, nodis valde incrassatis ad duplo crassioribus. Folia opposita, sessilia, ovata, 7—15 cm longa, 3—8 cm lata, basi rotundata vel cordata, apicem obtusiusculum versus acuminata, crassa, fragilia, utrinque opacissima, costa basin versus visibili, sed facie inferiore rufa crassiore quam facie superiore, nervis ceteris vix visibilibus. Capitula gregata in axillis foliorum et circum nodos defoliatos; pedunculus 0.5—2 mm longus, c. 1.5 mm crassus, maxima parte in scrobiculo corticis immersus; bracteae brevissimae breve obtuseque triangulares, c. 0.5 mm longae; bracteolae paulo distinctiores vix maiores. Calycis tubus campanulatus, c. 2.5 mm longus, 1.25 mm latus, limbus erectus vel nonnihil cupuliformis, integer vel brevissime dentatus, c. 0.5 mm longus. Corolla statu alabastri adulti 1.25 mm longa, supra basin rotundatam c. 2.25 mm lata, in tertia parte inferiore gradatim attenuata, in tertia parte media c. 1 mm lata 5-angula, in tertia parte superiore in clavam 5-angulam obtusiusculam 1.25—1.5 mm crassam incrassata, latere interiore ad c. 2 mm supra basin squamulis 5 brevibus rotundatis deflexis, statu aperto ignota. Antherae c. 3 mm longae. Stylus quam corolla paulo longior, a basi ad apicem attenuatus; stigma styli apice vix crassius, subglobosum. Fructus ignotus.

Lombok, G. Rindjani, Mt. Poesoek, Sembaloen valley, 1300—1500 m alt., Elbert 1700.

I had to describe this species after not very good materials. All the leaves are more or less broken, the flowers unopened but probably

adult for the greater part. Most closely allied are *Dicymanthes elliptica* DANSER, from Java and Selebes, with small scales at the inside of the petals and different leaf-shape, and *Dicymanthes longipes* DANSER, from Bali, with much longer peduncles and likewise different leaf-shape. The Philippine *Dicymanthes* species show more important differences. The little developed bracts and bracteoles of *D. lombocana* are very peculiar.

CHLOOTHAMNUS, A NEGLECTED GENUS OF BAMBUSACEAE,

by

J. TH. HENRARD

(Leiden).

Although the genus *Chloothamnus* was described by BUSE in the year 1854, it was not inserted in „Die natürlichen Pflanzenfamilien" by ENGLER and PRANTL, where the family of the Gramineae as worked out by Prof. E. HACKEL. Indeed, HACKEL, who had at that time no access to BUSE's material, could only accept the facts found in the literature of the subject and therefore mentioned BUSE's genus under *Schizostachyum,* considering it as belonging to that genus according to KURZ and having drooping spikelets. All the authors who had to do with BUSE's genus tried to identify it only with the description given by BUSE, however, without consulting the beautiful type material of the author, preserved in the Rijksherbarium at Leiden. But even from the description, an excellent one, it is impossible to place *Chloothamnus* under the genus *Schizostachyum* as KURZ proposed. Since the new genus of BUSE is a very characteristic one with one interesting species, I wish to deal with this plant here more in detail after a careful study of the type material and the literature of the subject. For that purpose it is necessary to give BUSE's descriptions *in extenso* to point out why so many authors had so different and wrong ideas concerning this plant. Furthermore I can give some new characters of the genus and, after reexamination of all the characters of the spikelets, explain some points of the terminology, used by BUSE. The description by this author runs as follows:

Chloothamnus. Paniculae parvae paucirameae fere omnium ramorum sunt termini. Spiculae pedicellatae lanceolatae, subquiqueflorae, floribus 4 inferioribus ad glumellam inferam redactis. Glumae adhuc distinguendae, parvae, acutae. Glumellae inferae superiora versus sensim fiunt majores, omnes coriaceae. Glumella supera tantum in flore supremo, unice absoluto. Lodiculae 3 pentagonales, marginibus conduplicatis apice longe ciliatis. Stamina 6. Stylus subnullus, stigmata 3 germini insident lagenaeformi. Caryopsis......

Chloothamnus chilianthus Buse. Gramen excelsum, perelegans, habitu Chusquaeis non absimile, at sui generis, hexandrum, tristigmaticum.

Habitat insulam *Sumatrae,* in provinciae *Angkolae superioris* sylvis, altit. 1—3000′ JUNGH.

Rami mihi prostant septempedales iique forsan laterales. Sunt glabri, striati, ianes. Nodi parum crassi. Ramuli infra seni aut quini, supra minori numero, nunc fasciculatim nunc veluti verticillo undique prorumpentes, bracteis pluribus interjectis et subjectis. Folia parva, tenuia, saltem in ramis florentibus, supra glaucescentia, infra glauca, glabra, margine minute denticulata, nervo medio in inferiore tantum pagina conspicuo, nervis lateralibus primariis utrinque 3—5, transversalibus conspicuis. Vaginae more solito auriculatae, setosae, ligula abbreviata. Ramuli fere omnes panicula terminati, basi folii supremi vagina vaginati, protracta solutave vagina; panicula rarissime videtur lateralis. Rachis applanata, acutangula, brevis, ramos gerit paucos simplices vel in ramulos subternos iterum divisos. Spiculae cernuae, secundae, 6—24 ad plurimum in panicula, plerumque simplices, sed et aliquando gemmula minuta basi auctae occurrunt, normaliter absolutae, sed etiam more Bambusacearum solenni magis minusve evolutae. Glumae glabrae, acutae, carinatae, infera brevior. Glumellae inferae glabrae, nervis prominulis; glumella supera, quae tantum florem absolvit unicum superiorum, margine involuta, apice pilosa, nervis vix prominentibus.

From this description we see that BUSE's plant cannot belong to the genus *Schizostachyum* on account of the utterly different inflorescence which has, as BUSE correctly indicated, the habit of that of the genus *Chusquea,* the latter, however, being confined to South America. Important are the lodicules in BUSE's species, which are wanting in the genus *Schizostachyum.* By studying the spikelets of BUSE's type we learn somewhat more about his concept of the organisation of the spikelets. These spikelets have two lower short scales, representing the two glumes as generally found in the grasses; BUSE too calls them glumae. The next scales, gradually becoming larger, are also sterile, having no trace of flowers in their axils, in reality there are 4 of such scales in nearly all the spikelets I examined. BUSE gives 4 of such glumellae but mentions the spikelets as „subquinqueflorae". If we carefully remove the sterile scales, we have a rhachis with the only flower of the spikelet at the top, under a high power we see that the continuation of the rhachis is not extant, laterally we see at the end of the rhachis

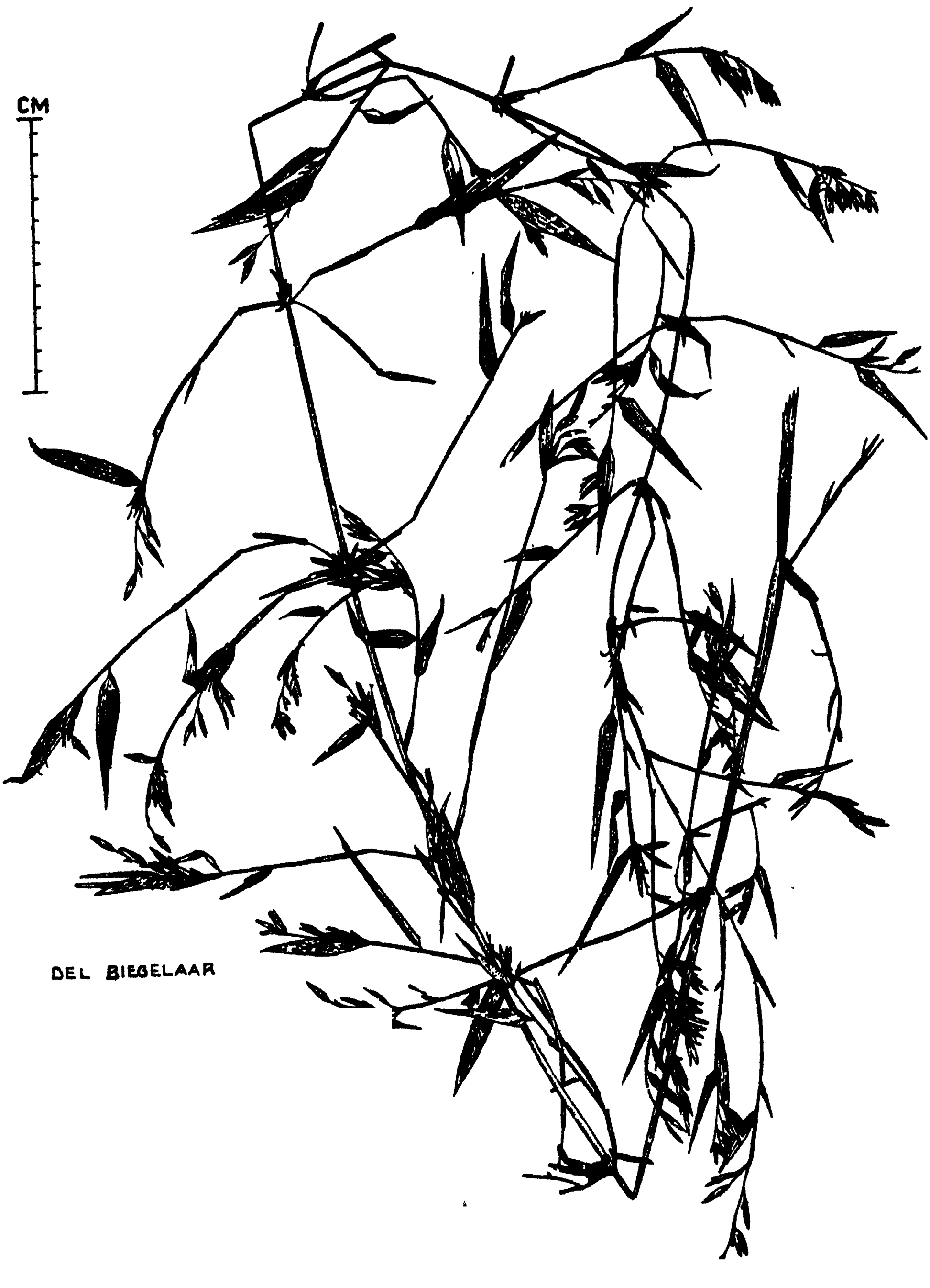
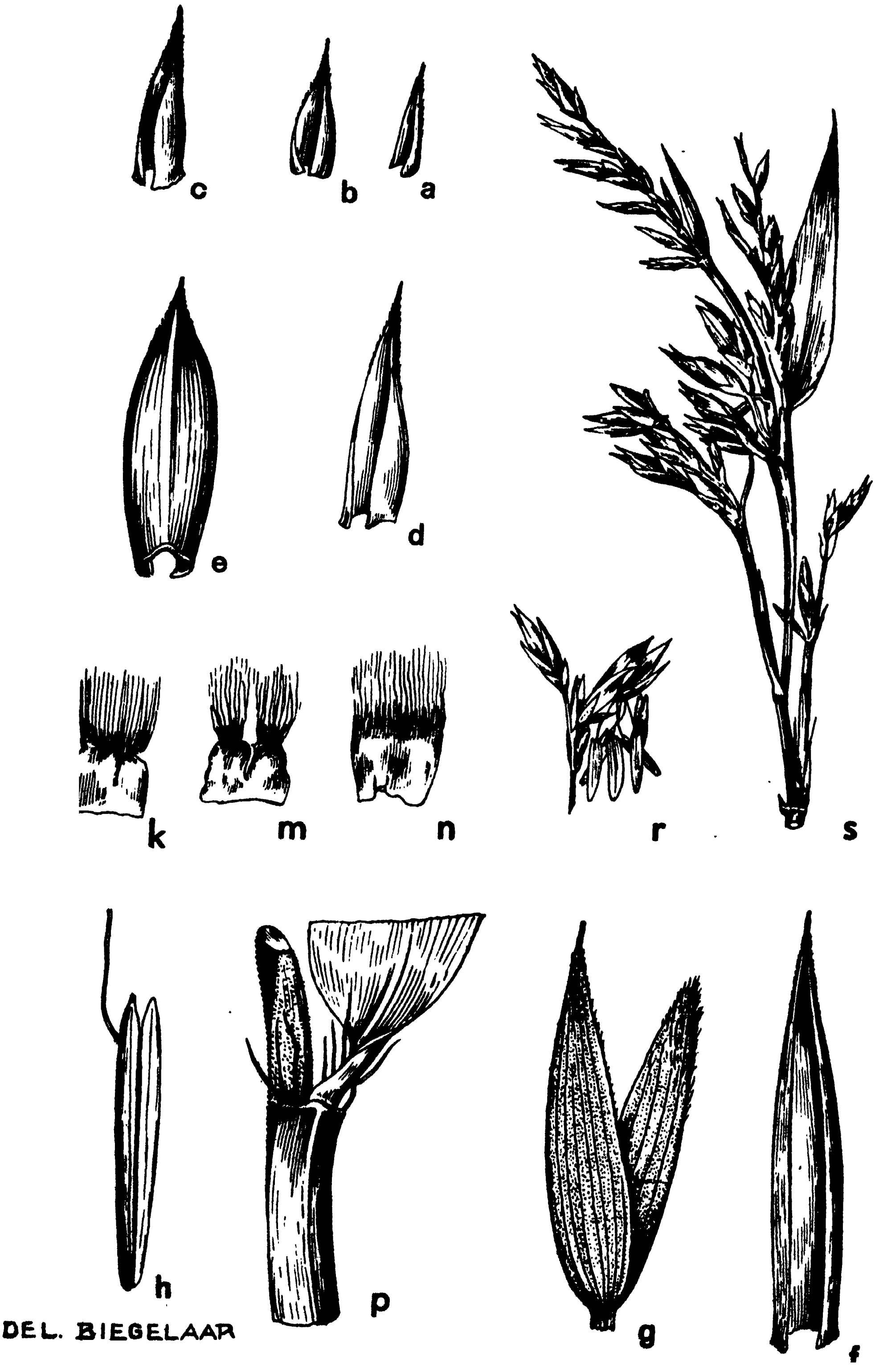


Fig. 1 — *Chloothamnus chilianthus* Buse — From type specimen.

only a very minute conical elevation which is often scarcely visible. This is a very important character because in the genus *Schizostachyum* there is a rather long and very distinct prolongation of the rhachis which not rarely bears a small rudiment of a glume. Another important point of difference is that the spikelet of *Schizostachyum* is in reality a small inflorescence, the rhachis being branched from the sterile scales; such spikelets are therefore indicated as pseudo-spikelets, whereas in *Chloothamnus* the spikelets do not differ from typical grass-spikelets, with the exception of the lower scales which bear no flowers. If we now look at the flower at the top of the rhachis, we find that it consists of a fertile lemma having the aspect of the sterile ones and a palea; the latter is slightly shorter than its fertile lemma and differs from the common palea as found in grasses in being of quite the same form and structure as the fertile lemma and in being not provided with two keels. In *Schizostachyum* the palea is keeled and sulcate, and the sulcus is occupied by the slender prolongation of the rhachis. All the characters enumerated above are so different from those of the genus *Schizostachyum* that it is evident that BUSE's genus *Chloothamnus* cannot be united with the genus *Schizostachyum*. I suppose, this question is now definitively settled.

We now come to the question: what have later authors done with BUSE's genus? First of all we go to Colonel MUNRO's monograph of the *Bambusaceae* from the year 1866 and find there that he too did not see the plant of BUSE. Under the genus *Nastus* he gives as the distribution also Sumatra with a ? and says further on: „I am not acquainted „with *Chloothamnus* of BUSE, except from the description of the genus „given by MIQUEL, and, with the sole exception of no mention being „made of the terminal barren pedicel, I cannot discover any difference „between it and *Nastus*." MUNRO further cites JUNGHUHN's locality under the distribution of *Nastus borbonicus* GMELIN, which was described from the island of Bourbon and is growing there at an altitude of 3000 to 4000 feet. „This *Nastus borbonicus* is a most beautiful grass, flowering „in September and October, when the stamens are exserted and hanging „from the spiculae. It is quite an alpine plant, and forms a well-marked „and remarkable belt all around the island of Bourbon, interrupted „only in places where the flow of lava prevents vegetation." (p. 75). MUNRO remarked that it is very interesting that a plant which was supposed to be confined to a very considerable elevation (3000—4000 feet above the sea) in Bourbon, should also be found in Sumatra, probably in a similar volcanic district (but at lower altitudes). Now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DEL. BIEGELAAR

I saw and studied authentic material of this *Nastus borbonicus* and it is very striking to see how much it resembles the *Chloothamnus* of Sumatra in habit, having the same whorled floriferous branches, with the subsecund drooping spikelets which have the same form as those of BUSE's plant. *Nastus borbonicus,* however, differs distinctly in the hairy sheaths and glumes and especially in the palea of the flower which is sulcate with two keels and a prolongation of the rhachis which is placed exactly in the sulcus. MUNRO's identification is better to understand than KURZ's one and proves that the carefully studied BUSE's description. On account, however, of the prolongated rhachis and the sulcate, two-keeled palea of the genus *Nastus* we cannot unite *Chloothamnus* with *Nastus* although the two genera at first sight seem to be the same. We have here once more a striking convergency which is known in different other families, e. g. *Evolvulus* and *Jacquemontia* in the *Convolvulaceae.*

Colonel MUNRO described in his monograph also *Melocanna gracilis* KURZ, a name taken from a manuscript note, the type being WALLICH no. 5032. From the authentic description it is clear that this plant does not belong to the genus *Chloothamnus* because the palea is two-keeled and sulcate.

In the year 1870 S. KURZ, the curator of the Calcutta Herbarium, wrote an article on some new or imperfectly known Indian plants in the Journal of the Asiatic Society of Bengal. Here different bamboos are dealt with and we find there under no. 95 (p. 88) his opinion, that *Melocanna gracilis* KURZ, apud MUNRO, is *Schizostachyum chilianthum,* (*Chloothamnus chilianthus* BUSE). The difference between *Melocanna* and *Schizostachyum* rests entirely in the fruit, and not in the absence of the upper palea, as suggested by Col. MUNRO.

This identification, although being wrong, as we know at present, by such an authority as KURZ was accepted in the Index Kewensis and since that time the genus of BUSE was lost. Unfortunately the misidentification of KURZ, was not discovered by J. S. GAMBLE when he published his great work on the Bambuseae of British India in the Annals of the Royal Botanic Garden, Calcutta in 1896. Here the name *Schizostachyum chilianthum* KURZ was accepted for a plant which was

Fig. 2 — *Chloothamnus chilianthus* BUSE — *a, b, c,* glume I, II and III (× 6); *d* gl. IV (× 5); *e* gl. V (× 4); *f* gl. VI (× 5); *g* flower with fertile lemma and palea (× 5); *h* stamen (× 6); *k, m, n,* lodicules (× 6); *p* sheath with portion of the blade (× 3); *r* group of spikelets, one of them with exserted stamens (about nat. size); *s* flowering branch (× 1) — From type specimen.

figured on plate no. 101 from a specimen, collected at Batang, Malacca, by VAUGHAN STEVENS (no. 3947). A glance at the plate and a study of the description proves that GAMBLE described a plant which is very different from the true *Chloothamnus* of BUSE. GAMBLE says: „I have „followed KURZ in identifying his *Melocanna gracilis* with *Chloothamnus* „*chilianthus,* BUSE, although BUSE's description does not agree in all „particulars. (See also note in BENTH. and HOOKER FIL. Genera Planta- „rum, p. 1214.)."

Another important publication was given by BUSE himself three years after the publication of his new genus. He studied the grasses collected by Prof. REINWARDT and found among them a bamboo named by REINWARDT as *Bambusa tenuis* in his herbarium. He recognized this bamboo as belonging to his genus *Chloothamnus* and described it as a variety *subscraba* of his *Chloothamnus chilianthus* in Plantae Indiae Batavae Orientalis, published by Prof. DE VRIESE in the year 1857. In this publication we find on p. 114 under the tribus *Bambusacea* the following notes by BUSE:

Chloothamnus chilianthus Buse var. *subscraba Buse:* spiculis erectis, glumis glumellisque subscabris.

Hab. Collegit in Java, sub nomine Bambusae tenuis, Rwdt. Speciem ipsam in Sumatra Jungh.l.l.

It is important to give here further BUSE's opinion on this plant, saying:

Unum tantum in herb. specimen idque tamen absque dubio non nisi varietatis titulo a speciminibus Junghuhnianis discrepans. Glabrities enim aut scabrities in Bambusaceis non magni momenti est; pendetque saepius a vegeta aut laxiore speciminis indole, quam ob causam et spicularum directio, quod nempe sint erectae aut cernuae, variat; simile quid praebent *Bromi* nonnullae species.

Now the type of this variety was preserved in BUSE's own herbarium, which after BUSE's death was presented by the heirs to the Rijksherbarium. This specimen I carefully studied. Unfortunately it is not in a good condition. It consists of a branch, about 40 cm long, with whorled flowering-branches; most of the spikelets are fallen off, the spikelets so far as present are more or less damaged and only one flowering-branch bears a part of a leaf. The sheet bears in ink a label by REINWARDT with the name in his handwriting as *Bambusa verticillata,* the name *verticillata* deleted and replaced by the name *tenuis.* There is another label reading „arborea inermis" and something illegible in lead pencil. There is, moreover, BUSE's label in his hand with the data

as given in his description. On this authentic specimen, I studied the characters of the spikelets and I compared them with those of the type of *Chloothamnus chilianthus*. Quite as in the true *Chloothamnus*, there are two small lower glumes followed by four longer sterile glumes, gradually becoming longer, there is a very minute prolongation of the rhachis and but one flower, consisting of a fertile lemma and a palea of the same form and texture, there are six free stamens and 3 long-ciliate lodicules and the stigmas are feathery. In this organisation there are no differences between the plants from Sumatra and Java. The javanese specimen has spikelets in which the various glumes are somewhat longer but their length in the Sumatra plant is variable too. In the javanese specimen the spikelets seem to be erect, in reality they are subsecund and BUSE himself did not attach much importance to this character. As to the indumentum of the spikelets I must remark that the true *Chloothamnus* from Sumatra has not rarely a fertile lemma which is scabrous.

From all the data we now have at the moment from the two types it is obvious that the variety *subscabra* is scarcely to maintain so that the genus *Chloothamnus* occurs not only in Sumatra but also in Java. The dimensions of the spikelets of the species are in general: gl. I $2\frac{1}{2}$—3 mm, gl. II $3\frac{1}{2}$—5 mm, gl. III $4\frac{1}{2}$—5 mm, gl. IV about $7\frac{1}{2}$ mm, gl. V about 10 mm, gl. VI about 12 mm, fertile lemma about 12 mm, palea at least $10\frac{1}{2}$ mm, or in the javanese plant up to 11 mm long. In the type of the javanese plant the lemma is always much damaged, the tip broken off and the awn therefore never extant. The exact locality where REINWARDT collected his bamboo is unfortunately not known. I have no doubt that this locality is situated in Java indeed and I presumed that the same species was also represented in JUNGHUHN'S collection. As the latter, however, does not contain but sterile specimens, BUSE failed to recognize it. Accordingly, I went over the sterile specimens of bamboos in BUSE's collection. We know that BUSE in the year 1854 under the grasses, at the end of the family, gave an „Addenda ad Bambusaceas", where he treated the „stirpes steriles".

We find there 7 sterile bamboos, all collected by JUNGHUHN. It was especially the 7th species that called my attention. BUSE gives the following characters:

ramis praelongis; ramulis verticillatis, flexuosis, plurimis; foliis parvis, lanceolatis, basi attenuatis, petiolo longiusculo suffultis, utraque pagina laevibus, margine asperulis, tenue membranaceis, nervis non valde conspicuis.

Habitat *Javae* sylvas intactas prope *Pekalongan,* altit. 3—6000′. JUNGH. Incolae hanc vocant *Bambu oö,* fide JUNGH. — Species propria, scandens aut ramis pendentibus?

This plant is represented at the Rijksherbarium, with the label in BUSE's hand (H. L. B. no. 909, 65—112). There is another sheet with a label, probably written by JUNGHUHN himself and reading: „143 bambu ŏ ŏ Bosschen van Pegalongang [1]) 4300′ Preanger". (H. L. B. no. 909, 65—36).

These sterile plants (branches), especially the first-named one, have, in their verticillate arrangement, the same habit as the flowering-branches of BUSE's *Chloothamnus* and the younger leaves are not different from those of the fertile shoots of BUSE's species; petioles, auricles and ciliae agree also.

The genus *Chloothamnus* is now better established and very distinct from all the other genera known at that time. It belongs to the *Eubambusea* and is to place near *Bambusa* on account of the free stamens but it is quite distinct in the not two- but one-keeled palea. As to the palea the genus *Chloothamnus* comes nearer to the genus *Oxytenanthera* where the palea is also but one-keeled, the latter has, however, many other differences and is at once to exclude by the monadelphous stamens and the conical, narrow spikelets. In the type of the genus *Chloothamnus* the sterile scales of the spikelets are acute if seen laterally, expanded they are rounded at the top and bearing a distinct mucro or short awn. These scales are many-nerved, the number of the nerves being 9—13. The spikelets, seen *in toto,* are somewhat flattened on account of the keeled glumes, the latter are nearly smooth, whereas the fertile glume (lemma) and the palea are, under a high power, very distinctly punctulate and have moreover below the tips, a characteristic adpressed indument, consisting of straight very stiff rather thick hairs. The leaves in this genus are tessellate by transverse veinlets, very distinct when dry.

MIQUEL, KURZ and HASSKARL were acquainted with this interesting bamboo; having only sterile specimens, they did not recognize the species, because they failed to look for the plant from Sumatra. In my opinion, HASSKARL described the same plant under the name of *Bambusa elegantissima* in the year 1848 whereas KURZ placed this plant of HASSKARL under other genera such as *Beesha, Melocanna* and *Schizostachyum,* opinions which are altogether incorrect.

The incertitude whether the javanese bamboo, treated here, repre-

[1]) = Pengalengan.

sented a distinct genus or a member of an already described one, was at once removed when the javanese bamboo was found in flower. This occurred, according to the labels of the specimens, kindly put at my disposal by the Herbarium at Buitenzorg, in the year 1903 or 1904. The very beautiful material, which is now represented in all the larger herbaria of the world, was collected by BOSSCHA near Malabar in Priangan (the type locality of *Bambusa elegantissima* of HASSKARL, as is evident from his description in the year 1848, where he cited his species as growing „In sylvis 4000 ped. elatis inter montes Tilu et Malabar provinciae Bandong in terra Preangereana copiosissime obviam venit; nom. sund.: A'wi ülül.")

These specimens from BOSSCHA were studied by VALETON and determined by him as *Schizostachyum elegantissimum* KURZ in the year 1905, a combination which is based upon HASSKARL's *Bambusa,* mentioned above. The exact locality of JUNGHUHN's plant is according to his label, in the Preanger at 4300 feet near Pengalengan (written by JUNGHUHN as Pegalongang). BOSSCHA's specimens belong to the genus *Chloothamnus.* The identification of VALETON was quite correct, but unfortunately he followed KURZ and placed the species in the wrong genus. Now the question was definitively settled when Prof. PULLE found the species in flower in the year 1906 near the high plateau of Pengalengan at 1600 m altitude near Malabar too. These flowering specimens had reduced leaves only, they agree perfectly with BOSSCHA's plants. It was KOORDERS who communicated a specimen of Prof. PULLE's no. 3173 to J. S. GAMBLE, the monographer of the Indian Bambusaceae, who recognized the plant as belonging to a new genus named by him *Oreiostachys* with the species *O. Pullei* GAMBLE. A publication of this genus appeared in Verhand. Kon. Acad. v. Wetenschappen at Amsterdam Deel XVI, ii, p. 657 in the year 1908. This description was prepared from the flowering specimen of PULLE and from the sterile specimen of JUNGHUHN no. 143.

This new genus with one species agrees as to the desertipion and the type specimen perfectly with all the other specimens hitherto found in Java and belongs at the same time to the genus *Chloothamnus* of BUSE. KOORDERS gives in his article much information about the genus *Oreiostachys,* noting that it is more related to the genus *Sasa,* which was published by MAKINO and SHIBATA in the year 1901, a genus having 6 stamens with free filaments and 3 plumose stigmas, the leaves being finely tesselate. In *Sasa,* however, there is a distinctly bicarinate palea, moreover all the flowers of the spikelet are perfect with an imperfect

terminal one. *Sasa* is a japanese genus of shrubby bamboos. KOORDERS gives much other information as to the geographical distribution, but the genus is as we know at present not endemic in Java; it occurs not only in Sumatra but also in New Guinea. Having found the identity of the genera *Chloothamnus* and *Oreiostachys* we have to accept for the javanese plant the name *Chloothamnus elegantissimus* (HASSK.) HENR. nov. comb.. I have to add here that VALETON, according to determinations given by him in the Herbarium at Buitenzorg, gave to the plant the name of *Oreiostachys elegantissimus* (HASSK.) VAL. a name also accepted by BACKER in his Handb. Fl. Java (1928) p. 288.

In an additional paper by KOORDERS in Verh. Kon. Acad. Amsterdam, Deel XVII (1909) p. 127 on *Oreiostachys* we find some more data as to the fruit of the genus. I have in vain tried to find mature fruits in the rich material I had at my disposal, material kindly received for study from Kew and Buitenzorg. In our herbarium there is on the sheet of the specimen collected by BOSSCHA an envelope with fruits, as indicated in VALETON's hand, in reality these are no fruits but much swollen spikelets, infected by a gall, which is not rarely observed on the plant. Fine cigargalls were also found on the specimens which SCHEFFER already collected in the year 1871.

There is one point more I wish to memorate; GAMBLE, who recognized the genus, accepted the name *Bambusa elegantissima* HASSK. as a nomen nudum. Although HASSKARL's latin description is short and taken only from sterile material, the exactly given type locality points to no other bamboo and his name has therefore priority even over BUSE's name *chilianthum*. As to the identity of the plant from Java and that from Sumatra I must remark that only the javanese species is fully known in its vegetative and flowering parts. Unfortunately, the plant from Sumatra, although represented in very beautiful flowering material, is not known with the normal leaves in the vegetative state and there are, moreover, some slight differences, the bamboo from Sumatra being a more graceful and elegant plant and the short pubescence of the leaves just above the petiole on the lower surface, so distinct in the javanese plant, is scarcely visible in the bamboo from Sumatra. In the spikelet-characters there are, as is already pointed out, no specific differences.

For the moment I did not place BUSE's material in the Rijksherbarium under *Chloothamnus elegantissimus*; it seems to me that it is better to wait until the bamboo from Sumatra is fully known in its vegetative parts. The Kew Index accepts *Oreiostachys* as feminine and gives the specific name as *elegantissima*.

In modern time different other bamboos were described and placed in the genus *Oreiostachys*. Of course, if they indeed belong to that genus, they ought to be transferred to the genus *Chloothamnus*. I hope to give more information about this subject afterwards and place here another species under the genus *Chloothamnus*.

Chloothamnus Schlechteri (PILGER) HENR. nov. comb. = *Oreiostachys Schlechteri* PILGER in Engler, Bot. Jahrb. Band 52 (1914) p. 174.

The very good description points exactly to the genus *Oreiostachys* as already observed by PILGER in a note. This species is very characteristic by the long-awned glumes of the spikelets.

Oreiostachys producta PILGER in ENGLER, Bot. Jahrb. Band 62 (1929) p. 460 is a very aberrant species; it has a prolongation of the rhachis with a rudiment at the summit, this prolongation is about 7 mm long and the palea is two-keeled, the prolongation being imbedded in the sulcus. PILGER noted already these facts but accepted his new species as allied to *O. Pullei* and *O. Schlechteri*. The species is however insufficiently known and PILGER thinks that this plant may be a small bamboo. For the moment I therefore hesitate to place *Oreiostachys producta* under the genus *Chloothamnus*.

Oreiostachys ciliata (CAMUS) NAKAI in Journal Arnold Arboretum. VI. (1925) p. 152 = *Arundinaria ciliata* CAMUS in Bull. Mus. Nat. Hist. Paris XXV (1919) p. 672.

NAKAI's description of the genus is different from the original one and does not agree with the type of the genus. He mentions only a few characters, two styles having no plumose stigmas, the obtuse glumes do not agree with the true *Oreiostachys*. The name was based upon a bamboo from Cambodja, collected by PIERRE. From the description given by Miss CAMUS it is, in my opinion, evident that this species is not an *Oreiostachys* at all. The very long, many-flowered spikelets and the implicate ciliolate keels of the palea demonstrate this. *Arundinaria ciliata* is moreover a not climbing bamboo.

The localities (Priangan, W. Java) of the *Chloothamnus elegantissimus* specimens are extensively cited in the Excursionsflora von Java by KOORDERS. I have to add here the following:

W. Java: Priangan Regencius: Bandoeng; Tjibeureum, leg. J. J. Smith no. 636, 20 IX 1911, sterile, 1600 m (Herb. Buitenzorg) — *G. Goentoer*, ravine of the Tjiboenilarang near Kamodjais, leg. B. H. Danser no. 6744, 30 V 1928, flowering, circa 1400 m (Herb. Buitenzorg, Herb. Leiden).

In the present paper I have given the name of the author of the

genus *Chloothamnus* as BUSE. In the first article of BUSE the name was published by MIQUEL as *Büse* with the new species of that author, but his article on the Gramineae was followed by the words: „exposuit *L. H. Buse*". The author himself always wrote his name and signed his labels in his herbarium as *Buse*. Afterwards when he wrote a second paper on grasses, published by DE VRIESE in 1856, his name was constantly, throughout the whole paper, given as *Buse*. The spellings *Büse* or *Buese* found in the literature are therefore wrong.

My sincere thanks are due to the curators of the herbaria at *Buitenzorg* and at *Kew* for the kindness, with which they have put the material of this genus at our disposal.

Summary.

Chloothamnus BUSE ap. MIQUEL, Pl. Jungh. 1854, 386 — *Oreiostachys* GAMBLE ap. KOORDERS, Verh. Kon. Ak. Wet. **16**, 1908, 657..

Hab.: Malay Archipelago.

1. **C. chilianthus** BUSE, l. c., type species of the genus — *Schizostachyum chilianthum* (BUSE) KURZ, Journ. As. Soc. Beng. **39**, ii, 1870, 88 — *non Melocanna gracilis* KURZ ap. MUNRO, Transact. Linn. Soc. **26**, 1866, *nec Schizostachyum chilianthum* in GAMBLE, Ann. Roy. Bot. Gard. Calc. 7, 1896, 116, pl. 101.
   Hab.: Sumatra (Angkola 300—900 m).
2. **C. elegantissimus** (HASSK.) HENR., nov. comb. — *Bambusa elegantissima* HASSK., Pl. jav. rar. 1848, 42 — *Beesha elegantissima* (HASSK.) KURZ ap. MUNRO, l. c. 1866 — *Schizostachyum elegantissimum* (HASSK.) KURZ, l. c. 1870, 90.
   Hab.: W. Java (Preanger, 1500—1600 m).
   Remark: Possibly identic with the preceding species.
3. **C. Schlechteri** (PILG.) HENR., nov. comb. — *Oreiostachys Schlechteri* PILG., Engl. Bot. Jahrb. **52**, 1914, 74.
   Hab.: N.E. New Guinea (Dischore, 1300 m).

Literature.

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1848 — HASSKARL, J. K. Plantae Javanicae rariores, p. 42.

1854 — BUSE, L. H., ap. Miquel: Plantae Junghuhnianae, p. 386.

1855 — MIQUEL, F. A. W. Flora van Nederlandsch Indië, III, p. 414 et 419—420.

1857 — BUSE, L. H., ap. de Vriese: Plantae Indiae Batavae Orientalis, fas. II, p. 114.

1862 — MIQUEL, F. A. W. Sumatra, zijne plantenwereld en hare voortbrengselen, p. 264.

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1896 — GAMBLE, J. S. The Bambuseae of British India. Annals of the Royal Botanic Garden, Calcutta. Vol. VII, p. 116.

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1911 — KOORDERS, S. H. Excursionsflora von Java, I, p. 169.

1919 — CAMUS, A. Espèces et variétés nouvelles de Graminées de l'Asie Orientale. Bull. Mus. Nat. Hist. Nat. Paris, 25, p. 672.

1925 — NAKAI, T. Two new genera of Bambusaceae. Journal of the Arnold Arboretum, Vol. VI, p. 152.

1928 — BACKER, C. A. Handboek voor de Flora van Java, Afl. 2, p. 287.

CONTRIBUTIONS TO THE HISTORY OF BOTANICAL SCIENCE.

Although this journal is more particularly destined to contain the results of taxonomical and geographical studies, it may sometimes provide accomodation for subjects of a different, though kindred nature. The more so, when an item is concerned, which is, in some way or another, closely allied to the editing institution.

The apparently long-forgotten XVth Century MS., rediscovered in the library of the Rijksherbarium, is therefore a worthy subject for a series of papers under the general title proposed above. It has been carefully transponed into modern type, as may appear from the quotations given. Both the entire rewritten MS. and the original may be consulted in the Rijksherbarium and I avail myself of this opportunity to request the interest and, if possible, the cooperation of anyone, who may know something to solve the problem of its origin.

As has been mentioned in the introduction, the first 35 pages as well as the title are wanting. It may be suggested, that this part is preserved in some other library, though it not necessarily needs to be dealing with the same subject. Anyhow, we would be greatly obliged, if we could be informed as to the lacking part.

The MS. was shown to Prof. H. P. Blok, MS. keeper of the University Library (cf. text below), to Dr. F. W. T. Hunger, the well-known connoisseur of herbals and botanical MSS. and to Dr. P. C. Molhuysen, director of the "Koninklijke Bibliotheek" at The Hague. Neither of these gentlemen could identify the MS. with any book known to them. I am pleased to tender them my best thanks for the kind interest they took in the matter.

The MS. collection of the University Library of Leiden does not contain anything which could be considered as the part wanting. However, it is possible that the MS. hails from the collection of Vossius, the greater part of which is preserved at Leiden, being originally a private collection of Queen Christina of Sweden (cf. Catalogue of the so-called MSS. Chymici Vossiani, by Gronovius, 1716, p. 359 s. s.).

Any information on the matter will therefore be greatly appreciated.

It may be added that Dr. Lütjeharms and Dr. van Ooststroom intend to deliver some more contributions to the series started herewith. The Rijksherbarium owns some old herbaria, which deserve to be more universally known, such as a herbarium, ascribed to Boerhaave, the magnificent herbarium of Rauwolff (± 1575), the Ceylon herbarium of P. Hermann, the Plantae rariores Borussiacae et Cassubicae of Breyne and a herbarium presumably also collected by Breyne in the neighbourhood of Danzig.

The Editor of "Blumea"

I.

ÜBER EINE BOTANISCHE HANDSCHRIFT AUS DEM 15. JAHRHUNDERT

von

W. J. LÜTJEHARMS und S. J. VAN OOSTSTROOM

(Leiden).

Mit einer Figur und zwei Tafeln.

Im Laufe des Jahres 1935 wurde von uns in der Bibliothek des Reichsherbariums in Leiden eine alte botanische Handschrift gefunden, welche wir ihrer grösstenteils sehr guten Wasserfarbenzeichnungen wegen, hier einer näheren Besprechung unterziehen wollen.

Das Manuskript, das wahrscheinlich ursprünglich mit einer Einbanddecke versehen war, wurde lose in einem nicht hinzugehörigen Pergamentband aus dem 18. Jahrhundert angetroffen. Es besteht aus 87 Blättern, numeriert von 36 bis zu 123 einschliesslich; fol. 98 fehlt. Die Höhe der Blätter beträgt 29.2, die Breite 21.2 cm. Das erste Blatt, fol. 36 (r), enthält die Bemerkung: Msstum Botan. Saec. XV, und ist weiter mit einem aufgeklebten Zettel versehen, welcher vermutlich die Unterzeichnung SCHRANK trägt, und in dem dieser mitteilt, dass es hier eine Handschrift betreffe, die aus dem Nachlass eines bestimmten GLACIUS herrühre. Weiter haben wir betreffs der Herkunft des Manuskripts und der Weise wie das Reichsherbarium es erworben hat, leider nichts ermitteln können.

Aus einer Untersuchung der Wasserzeichen im Papier stellte sich heraus, dass davon sechs verschiedene anwesend sind (Fig. 1, *a*—*f*). In vielen Fällen kommt ein Kuhkopf mit einer Blume vor, in drei verschiedenen Variationen. Auch ein Dreiberg mit Kreuz ist oft anwesend während ein Turm und ein gothischer Buchstabe P, an der Obenseite mit einer vierblättrigen Blume versehen, beide nur einmal vorkommen.

Vergleichen wir diese Wasserzeichen mit denen, welche von BRIQUET (1) abgebildet wurden, so sehen wir, dass der Kuhkopf in fol. 41, 45, 46 und 47 (Fig. 1, *a*) eine ziemlich grosse Uebereinstimmung mit Abb. 14847 dieses Verfassers zeigt (tête de boeuf sommée d'une fleur portée par un trait ou par une tige). Auch das pfeilähnliche

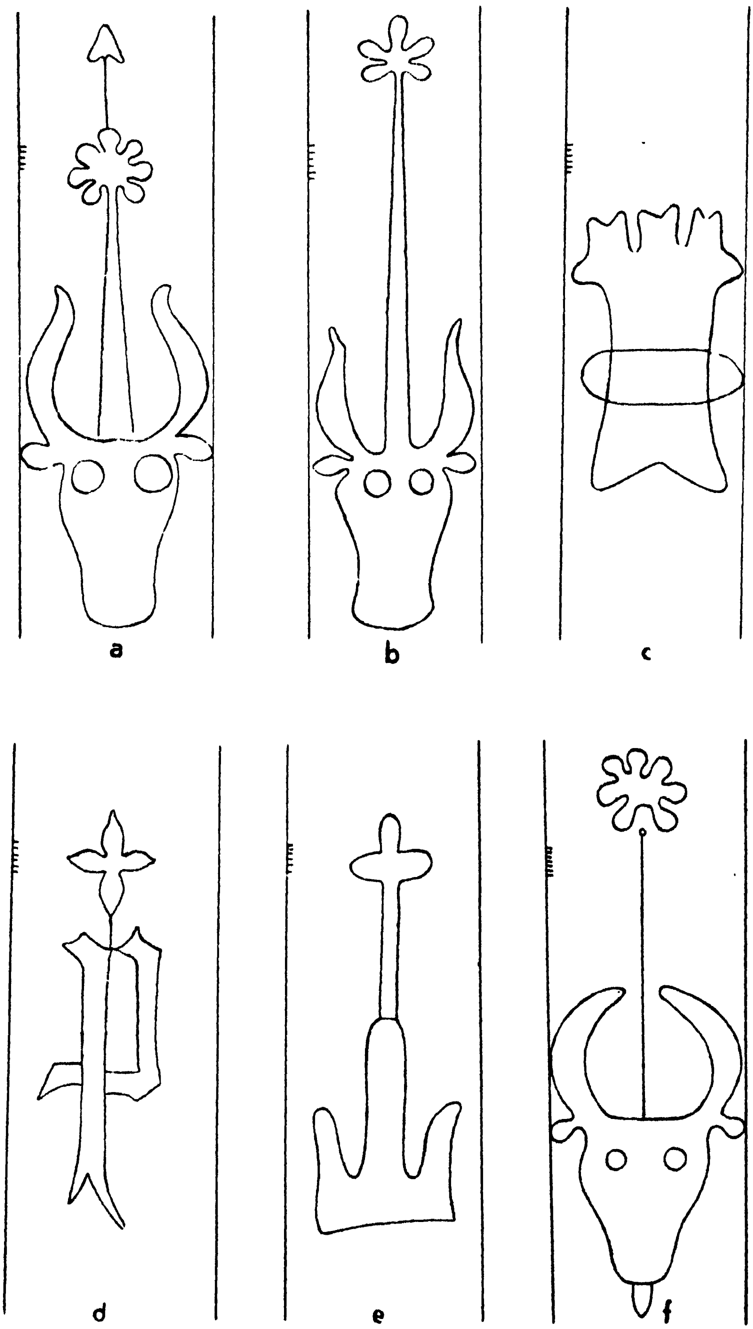


Fig. 1. Wasserzeichen. *a.* in fol. 47; *b.* in fol. 42; *c.* in fol. 48; *d.* in fol. 49; *e.* in fol. 50; *f.* in fol. 63.

Gebilde über der Blume kommt in beiden vor. In fol. 42 (Fig. 1, *b*) und einigen anderen (fol. 63—65, 67, 69, 73, 87, 89, 91, 97, 100, 105,

107 und 108) tritt der Kuhkopf wieder auf, in diesen Fällen jedoch ohne den Pfeil, wohl aber mit der Blume. Den Dreiberg mit Kreuz (Fig. 1, *e*) finden wir in fol. 50, 52—54, 56, 60, 76, 80—82, 84, 85, 99, 112, 114, 117, 119, 120 und 122 und derselbe stimmt fast völlig überein mit BRIQUET's Abbildungen 11789 und 11790, besonders mit der erstgenannten (trois monts surmontés d'une tige à double trait, portant une croix blanche); der Turm (fol. 48; Fig. 1, *c*) ist denjenigen, die BRIQUET unter den Nummern 15873, 15875 und 15876 abbildet sehr ähnlich und schliesslich sind das gothische P mit der vierblättrigen Blume (fol. 49; Fig. 1, *d*) und BRIQUET's Abb. 8595 (lettre P gothique à fleuron à quatre feuilles) sich fast völlig gleich.

Fragen wir uns nun aus welchen Jahren diese bei BRIQUET abgebildeten Wasserzeichen stammen, so ergibt es sich, dass sie alle in Papier vorkommen, das zwischen den Jahren 1464 und 1491 verwendet wurde, also in der zweiten Hälfte des 15. Jahrhunderts. Dies stimmt also gut überein mit der Angabe auf dem ersten Blatte der Handschrift.

Weiter hatte Prof. Dr. H. P. BLOK, der Konservator der Handschriftensammlung der Universitätsbibliothek in Leiden, die Liebenswürdigkeit das Manuskript zu untersuchen. Er gelangte zu dem Resultat, dass auch die Schrift des Manuskripts aus der zweiten Hälfte des 15. (oder aus der ersten Hälfte des 16.) Jahrhunderts stammt.

Wir haben also jetzt drei Angaben, die völlig mit einander übereinstimmen in der Feststellung der Zeit der Herstellung des Manuskripts, sodass wir wohl annehmen können, dass es wirklich aus dem 15. Jahrhundert herrührt.

Was nun die Abbildungen und der dazu gehörige Text des Manuskripts anbetrifft die folgenden Bemerkungen; vgl. Taf. 2. Die abgebildeten Pflanzen sind im allgemeinen sehr gut zu erkennen, die Farbe ist bei der Mehrzahl der Pflanzen sehr natürlich wiedergegeben worden und ist sehr gut erhalten. Die Zeichnungen machen den Eindruck nach der Natur angefertigt zu sein, also nicht, wie so oft der Fall war, nach anderen Manuskripten und dergleichen kopiert zu sein, obwohl zugegeben werden muss, dass einige eine gewisse Aehnlichkeit mit Abbildungen des Hortus Sanitatis zeigen. Der weitaus grösste Teil unserer Zeichnungen ist sehr naturgetreu, und besitzt, wie SCHRANK schon auf dem Zettel auf fol. 36 (r) bemerkt, tatsächlich Vorzüge „die man solchen Gemahlden aus dem Zeitalter nicht zutrauen sollte".

Die Mehrzahl der Tafeln trägt den Namen der abgebildeten Pflanze auf deutsch, in einigen Fällen sind auf der gegenüberstehenden Seite auch Synonyme hinzugefügt worden. Dies ist der Fall auf fol. 36 (v);

42 (v); 45 (v); 48 (v), diese gehören nicht zu 49 (r) sondern zu 50 (r); 50 (v); 51 (v); 52 (v); 54 (v); 56 (v), diese Synonyme sind mit anderer Hand geschrieben worden; 57 (v); 58 (v); 59 (v); 73 (v); 89 (v); 92 (v); 101 (v); 103 (v); 107 (v); 108 (v); 109 (v); 120 (v).

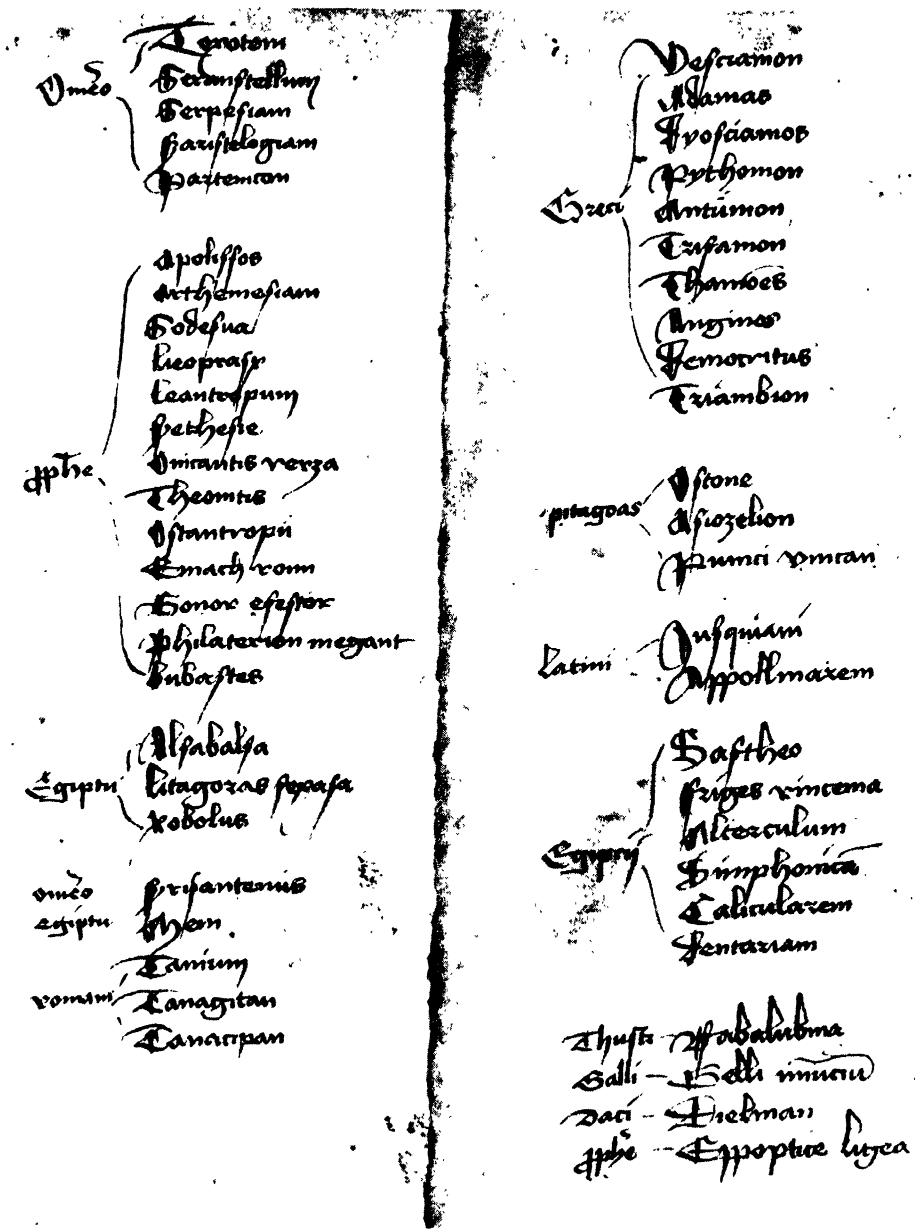
Vgl. Taf. 1 wo links die Synonyme, welche zum Beifusz, *Artemisia vulgaris* L. und rechts diejenigen, welche zur Bilse, *Hyoscyamus niger* L. gehören, abgebildet sind, und weiter das Verzeichnis der Namen und der Synonymen am Ende dieser Veröffentlichung.

In den Anfangsbuchstaben der deutschen Namen und Synonymen ist oft mit rot eine ganz einfache Verzierung angebracht worden.

Es kommt uns vor, dass das Manuskript anfangs aus den Wasserfarbenzeichnungen, versehen mit den deutschen Namen und den Synonymen zusammengesetzt war, und dass der Text später hinzugefügt worden ist, bald auf derselben Seite wie die Abbildung, bald auf der gegenüberstehenden. In einigen Fällen ist kein Text hinzugefügt worden, nämlich auf fol. 41 (r) Druszkraut; 68 (r) ohne Namen; 78 (r) Eselszfusz; 83 (r) Bromber; 84 (r) Floramor; 87 (r) Ziegenbandt; 95 (r) Goltkraut; 111 (r) Awerhan.

Ausser den Nummern der Blätter von 36 bis 123, rechts oben, tragen einige Blätter noch mit anderer Hand das Wort „fol." mit einer Nummer versehen. Dies ist der Fall bei fol. 37 (r): fol. 2; 39 (r): fol. 26; 43 (r): fol. 3; 52 (r) · fol. 6; 55 (r): fol. 8; 58 (r): fol. 11; 61 (r): fol. 11; 71 (r): fol. 5; 80 (r): fol. 20 und 97 (r): fol. 24. Es ist nicht klar worauf diese Angaben sich beziehen.

Weiter kommen bei einigen Abbildungen rechts oben, in unmittelbarer Nähe des Obenrandes noch Namen vor, mit sehr kleinen Buchstaben geschrieben, und zum Teil völlig unleserlich, auch wieder mit anderer Hand: auf fol. 62 (r): pilosella [?]; 63 (r): Tarassicon ... dens leonis; 66 (r): epatica; 70 (r): fol. 18 columbinij ...; 75 (r): Serpillu; 76 (r): mann ...; 83 (r): unleserlich; 90 (r): scolopendr...; 102 (r): qnqe nervia [?]; 105 (r), 115 (r), 116 (r) und 120 (r): unleserlich, während auf den unten angegebenen Blättern später auch noch die folgenden Namen und Bemerkungen hinzugefügt worden sind. Auf fol. 39 (r): Sanicula; 51 (r): Bilsen; 54 (r): f...... muntz; 54 (v), bei den Synonymen: Bulegium, boleij; 56 (v): Synonymen mit anderer Hand, siehe p. 82; 59 (v): zu den Synonymen ist hinzugefügt: urtica; 62 (r) hinter Meuszore: als heylkraute; 65 (r): Edree Leberkraut, Waldtmeyster; 66 (r): Solch Krauth in wein gethan/ wird nicht Saur; 71 (r) hinter Wegwart: wege Leuchttenis [?] oder Sonnenwirbell; 96 (r) hinter Walwurtz: als Schwartzwurtzel; 117 (r): hier fehlt der



Taf. 1. Links: Synonyme auf fol. 36 (v), bei Beyfusz, *Artemisia vulgaris* L.; rechts: Synonyme auf fol. 50 (v), bei Bylsen, *Hyoscyamus niger* L.

(Phot. J. P. M. BIEGELAAR).

ursprüngliche Namen und ist später hinzugefügt: Heydenisch Wundtkraudtt. Schliesslich finden sich auf fol. 67 (v), 99 (r) und 108 (v) noch einige, offenbar später hinzugefügte, Bibeltexte und religiöse Ergüsse.

Wie schon oben gesagt, ist uns, ausser der Bemerkung SCHRANK's über die Herkunft des Manuskripts nichts bekannt. Der Text zeigt grosse Uebereinstimmung mit LONICERUS' Kräuterbuch (3), das aber in der Ausgabe vom Jahre 1737, welche uns vorliegt, für die betreffenden Pflanzen ausführlicher ist als unsere Handschrift. Auch sind viele der angegebenen Verwendungsarten in dem Hortus Sanitatis zurückzufinden, was uns nicht wundern darf, weil doch LONICERUS, wie MEYER (4) bemerkt, zum Teil auf den Hortus zurückzuführen ist. Die meisten der im Manuskript vorkommenden Synonyme finden wir bei LONICERUS nicht. Diese Synonyme zeigen aber grosse Aehnlichkeit mit denen bei PSEUDO-APULEIUS, obwohl die Orthographie der Namen oft bedeutende Unterschiede aufweist, was aus einer Vergleichung mit HOWALD und SIGERIST's Ausgabe des PSEUDO-APULEIUS (2) hervorgeht. Für eine Vergleichung des Textes mit LONICERUS' Kräuterbuch sind zwei Seiten der Handschrift unten abgedruckt worden und schliesslich geben wir ein Verzeichnis der abgebildeten Pflanzen mit den deutschen Namen, wie sie im Manuskript vorkommen, samt den zurzeit gültigen lateinischen. Weiter sind in diesem Verzeichnis die Synonyme aufgenommen.

Beispiele des Textes der Handschrift.

51 (r):

Bylsen Kraut undt Sahmen ist kalter natur undt eigent schafft in den dritten Gradt/ vollkommen/ einer schadtlichen Gifftigen *quälitet* machet tohll undt schlaffen/

Dieses Saffts in die ohren gelaszen tödtet die wurme/ die wurtzel gesotten mit Eszig/ u: in den Mundt gehalten/ beniehmet das Zahnweh wer den Sahmen odter graudt iszet/ dem ist es ein gifft/ Den Saamen gepulvert/ mit frauwen milch/ eijerweisz u: mit ein wenig Eszig vermischt u: an den Schlaff gestrichen/ macht wohl schlaffen/ Mit mehl uber das *poda/ gra* gelegt/ stilt es.

Beste Zeit undt Distelierung ist wurzel u: blumen/ umb S: *Johan* Baptisten tag gebrandt/

Bilsen Krautwaszer vertreib alle wehe tage des haubts/ so von hitz kompt/ dz haupt da/ mit bestrichen/ so mans an die stirn/ u: schlaffe streichet/ machest wohl schlaffendt

52 (r):

Rawten

Ein guht *praeservativ* vor den Gifft/ nimb rautenbletter i loht/ feijgen ein ½ loht/ wacholdter i½ loht/ welschnusz 2 loht/ rosen odter wein Eszig 4 loht/ stoszes durch ein andter/ nutze es morgens nuchtern/ ehe man an die lufft gehet/ ist sehr guht vor den gifft/

Rauten gesotten in Eszig/ den ge/ nutzet/ ist gut fur dz auffstoszen/ das hufft undt brustweh/ ist auch guht denen/ so einen kurtzen Adtem haben/ benimpt den Husten/ Heijlet das ge/ schwer aus der lunge/ darvon den entstehet die Schwindt sucht/.

Rauten blatter mit wein gekocht sambt den saahmen/ lindtert den husten/ undt das Keichen/ thut auff die lufft röhr der lungen/ undt sehr guht vor dz fieber. Rauten gesotten in waszer/ undt mit starcken wein gemischt/ vertreibet das Gurren im Bauch/ u: geschwulst undter den Ribben.

Die bletter abgestreifft von den stengel undt gebrandt mitten im Maijen. Disz $\overline{\text{V}}$ abenst u: morgens getruncken jedtes mahl auff zweij odter dreij loht/ ist guht zur böszen leber undt miltz/ auch fur den bösen magen/ Kombt zu hulff der lungen vertreibet geschwulst/ in der brust/ undt undter den ribben u: weihet die brust/ ist auch sehr guht vor die windt/

Dieses waszer ist sehr guht fur den husten/ wie auch for die Peste/ lentze/ ist auch sehr gut vor bösze augen/ den es vertreibet fell undt flecken/ der Augen/ machet sie lauter ist auch guht wiedter Krampff damit gerieben/ wie auch vor den schlag Tucher darein genetz/ undt die gliedter darmit gerieben/ ist guht for das zittern/ ist auch guht vor alle giffti/ ge thiere/ undt hundte bisz.

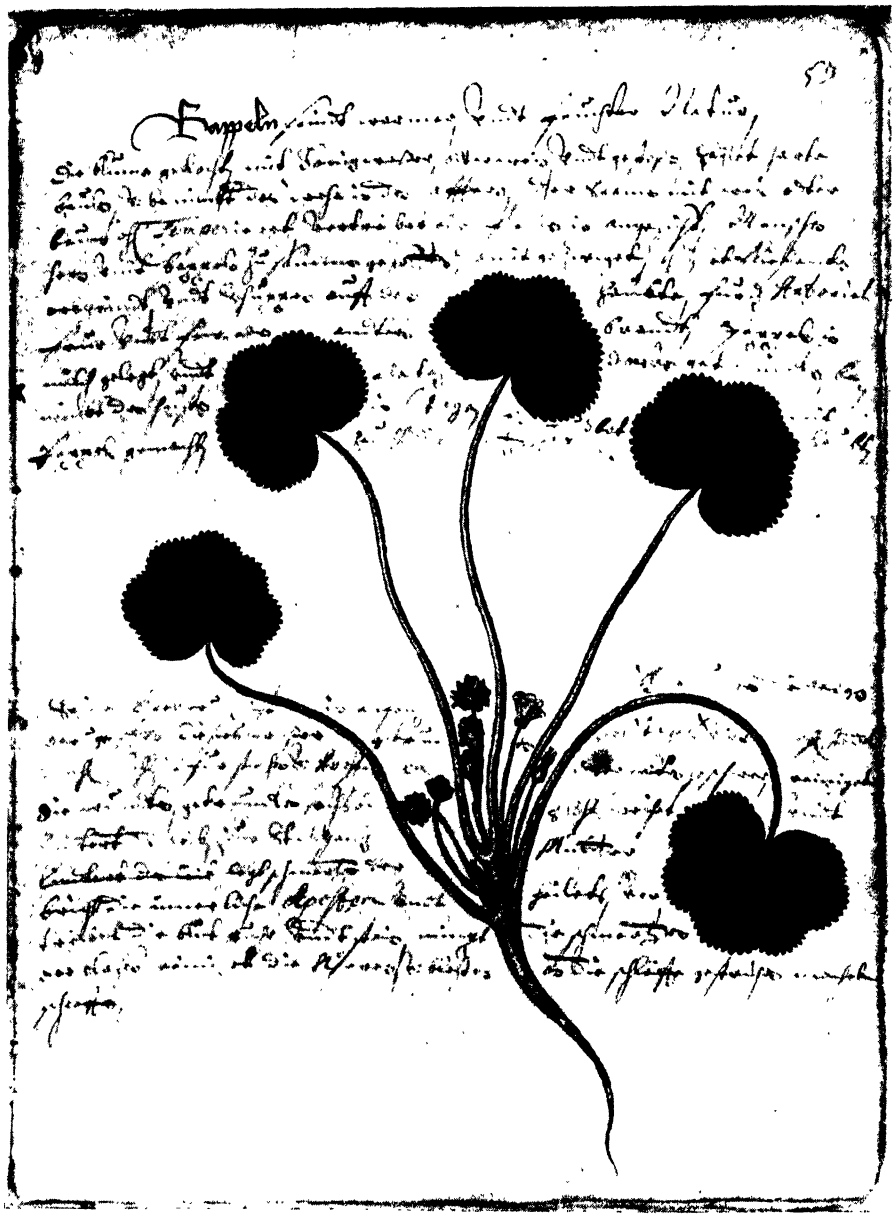
Verzeichnis der Abbildungen mit Namen und Synonymen.

37 (r). **Beyfusz** — *Artemisia vulgaris* L.

Synonyme auf 36 (v) (Taf. 1):

Omero [1]: Toxotem, Seranstellum, Serpesiam, Charistelogiam, Partenicon; *Prophetae* [1]: Apolissos, Arthemesiam, Sodesua, Heoprasx, leantropum, Chethesie, Onicantis verza, Theonitis, Ostantropii, Emach ronn, Bonox efestox, Philaterion megant, bubastes; *Egiptii*: alsabalsa, litagoras sexasa, xobolus; *Omero:* Chrisanteniis; *Egiptii:* Mem; *Romani:* Tanium, Tanagitan, Tanacipan.

[1]) Für die Rechtschreibung dieser Wörter vgl. Taf. 1.



Taf. 2. Bappeln, *Malva rotundifolia* L., fol. 53 (r).

(Phot. J. P. M. BIEGELAAR).

38 (r). **Eppich** — *Apium graveolens* L.
39 (r). **Sanickel** — *Sanicula europaea* L.
40 (r). **Winttergrun** — *Pirola minor* L.
41 (r). **Druszkrawt** — *Sedum Telephium* L.
42 (r). **Sijnnawe** — *Alchemilla vulgaris* L.
43 (r). **Wermut** — *Artemisia Absinthium* L.

Synonyme auf 42 (v):
Greci: Absintheon, Bachipigron; *Latini:* Absinthium rusticum.

44 (r). **Deschelkrut** — *Capsella Bursa-pastoris* Moench
45 (r). **Gundreben** — *Glechoma hederacea* L.
46 (r). **Grensinck** — *Agrimonia Eupatoria* L.

Synonyme[1]) auf 45 (v):
Greci: Nymphea, Praceam, Alicracalon, lothometram, Hydragagos, Heracleos, Andreos, Nerios, Clavum veneris, Digitum veneris; *Latini:* Alater, Herilania, Algam, Palustrem, Papaver Palustre.

47 (r). **Waltfan** — cf. *Eupatorium cannabinum* L.
48 (r). leer
49 (r). **S. Johannes Traubelein**[2]) — *Ribes nigrum* L.
50 (r). **Eybisch** — *Althaea officinalis* L.

Synonyme auf 48 (v):
Greci: Altee, Alteraxita, Malaon, Tetree, Aeolomolatin, Anadren; *Itali:* Ibiscum, Donamolatin.

51 (r). **Bylsen** — *Hyoscyamus niger* L.

Synonyme auf 50 (v) (Taf. 1):
Greci: Vesciamon, Adamas, Dyosciamos, Pythomon, Antiimon, Trifamon, Thamones, Anginos, Democritus, Triambion; *Pitagoas:* Ostone, Asiozelion, Punici vincan; *Latini:* Jusquiani, Appollinarem; *Egiptii:* Saftheo, friges vincema, Alterculum, Simphonicam, Calicularem, Dentariam; *Thusci:* Fabalubina; *Galli:* Gelli mincium; *Daci:* Dielman; *Prophetae:* Eppoptice ligea.

52 (r). **Rawten** — *Ruta graveolens* L.

Synonym auf 51 (v):
Ruta.

53 (r). **Bappeln** (Taf. 2) — *Malva rotundifolia* L.

Synonym auf 52 (v):
Malua.

54 (r). **Frawen Muntz** — *Tanacetum Balsamita* L.
55 (r). **Bolet** — *Mentha Pulegium* L.

[1]) Diese Synonyme gehören nicht hierher sondern zu *Nymphaea.*

[2]) Vermutlich später hinzugefügt.

Synonyme auf 54 (v):
Greci: Helichon, lencantos, blecho, Astenicon, Patx riron; *Prophetae:* Panthagathon; *Latini:* Pulein, Ostames, Dymaron, blechon.

56 (r). **Balsam** — *Mentha spicata* L. var. *crispata* Schrader

57 (r). **Maria rosen** — *Lychnis coronaria* Lam.

Synonyme auf 56 (v) [1]:
Lat.: verbascum, officinalis Tapsus barbatus, càndelaria, Candela regis, Lanaria, Lychnis coronaria; *Ital.:* Tasso barbasso; *Gall.:* Boillon; *Hisp.:* verbasco.

58 (r). **Saluey** — *Salvia officinalis* L.

Synonym auf 57 (v):
Saluia.

59 (r). **Eysencrut** — *Verbena officinalis* L.

Synonyme auf 58 (v):
Greci: Iherabotane, Perstereona, Diose lacete, Pancremon, Aristereon, Cyparissos, Demetrias, Aschlepius alceas; *Egyptii:* Pempentar, Vertiperdum, Pitagosas; *Greci:* Tigrodion, Chamelicos, Sideritis, Curetis fersefomon; *Latini:* Verbenam, licinia, lustam, Columbina, Sirpina, Militarem.

60 (r). **Binsaug** — *Lamium album* L.

Synonyme auf 59 (v):
Greci: Achoron, Afrodision; *Galli:* piper apium; *Latini:* Veneria, Radix nautica, Unguencia, urtica [2]).

61 (r). **Ysop** — *Hyssopus officinalis* L.
62 (r). **Meuszore** — *Hieracium Pilosella* L.
63 (r). **Pfaffen Krut** — *Taraxacum officinale* Web.
64 (r). **Genszdistell** — *Sonchus oleraceus* L.
65 (r). **Lydgengel** — *Asperula odorata* L.
66 (r). **Lebercraut** — *Asperula odorata* L.
67 (r). **Erpercrut** — *Fragaria vesca* L.
68 (r). Abbildung einer Blattrosette, vielleicht von *Senecio Jacobaea* L., Namen fehlt.
69 (r). **Pungen** — *Veronica Beccabunga* L.
70 (r). **Storch snabel** — *Geranium palustre* L.
71 (r). **Wegwart** — *Cichorium Intybus* L.
72 (r). **Balderian** — *Valeriana officinalis* L.
73 (r). **Bybenel** — *Pimpinella Saxifraga* L.
74 (r). **Schelcrawt** — *Chelidonium majus* L.

[1]) Mit anderer Hand geschrieben.
[2]) Später hinzugefügt.

Synonyme auf 73 (v):
Greci: Celidonia, Peonia gtea, Amos clancios, Pondiostria, Felomneon, Ochomon; *Egiptii:* Machat, Moest; *Daci:* Ebustame; *Latini:* Hyrūdineā.

75 (r).	**Quendel**	— *Thymus vulgaris* L.
76 (r).	**Gauchheijl** [1]) odter **Grundtheil** [1])	— *Anagallis arvensis* L. ssp. *coerulea* Vollm.
77 (r).	**Johanszkrut**	— *Hypericum perforatum* L.
78 (r).	**Eselszfusz**	— *Chenopodium Bonus-Henricus* L.
79 (r).	**Clapper plumen**	— *Papaver Rhoeas* L.
80 (r).	**Dosten**	— *Origanum vulgare* L.

Synonyme auf 79 (v):
Greci: ... cletice, Aschlepion, Onitis, Conile, Panaces; *Latini:* Cinula galica, Origanis.

81 (r).	**Binerkraut**	— *Erythraea Centaurium* Pers.
82 (r).	**Johanszplumē crut**	— *Chrysanthemum Leucanthemum* L.
83 (r).	**Bromber**	— *Rubus caesius* L.
84 (r).	**Floramor**	— *Amaranthus spec.*
85 (r).	**Basilien**	— *Ocimum basilicum* L.
86 (r).	**Pastemenkrut**	— *Knautia arvensis* Duby
87 (r).	**Ziegenbandt** [1])	— vermutlich *Knautia arvensis* Duby
88 (r).	**Ochsenzungen**	— vermutlich *Echium vulgare* L.
89 (r).	**Weyszwurtz**	— *Polygonatum officinale* All.
90 (r).	**Hirsz zung**	— *Scolopendrium vulgare* Sm.

Synonyme auf 89 (v):
Greci: lonchitis, Hennonion, Scolopendrion, Perteygias, Perterigites, fildroditis; *Itali:* Teucrion, fildroditis; *Prophetae:* Hemogales; *Latini:* Splenion.

91 (r).	**Mutter crawt**	— *Melissa officinalis* L.
92 (r).	**Cyppresze**	— *Santolina Chamaecyparissus* L.
93 (r).	**Betomy**	— *Betonica officinalis* L.

Synonyme auf 92 (v):
Greci: Prioniten, Cesteon, Pirmen, Adiathon, indice, Cosmite, Psichotrosos, Chiariza, Feropondon, Pandiona, Diprimon; *Prophetae:* Jeratorine; *Latine:* betonica, Feratam.

94 (r).	**Nachtschadt**	— *Solanum nigrum* L.
95 (r).	**Goltkraut**	— *Thalictrum flavum* L.

[1]) Später hinzugefügt.

96 (r). **Walwurtz** — *Symphytum officinale* L.
97 (r). **Wegdret** — *Polygonum aviculare* L.
100 (r). **Rijngelblumen** — *Calendula arvensis* L.
101 (r). **Cletten** — *Arctium minus* Bernh.
102 (r). **Wegrich** — *Plantago lanceolata* L.

Synonyme auf 101 (v):
Greci: Arnoglosson, Arnion, ... acion, Cynoglosson, Eptaplenton, Polmeyton, Tirsion; *Prophetae:* Urbani nemnonos; *Latini:* Plantaginum, septene rufa.

103 (r). **Breit wegrich** — *Plantago major* L.
104 (r). **Hawszwurtz** — *Sempervivum tectorum* L.

Synonyme auf 103 (v):
Greci: Aizon, Aniola, Aitaleo, Semper viuit, Eritales; *Latini*: Semper folium, Barba Jouis.

105 (r). **Veh disteln** — *Silybum Marianum* Gaertn.
106 (r). **Berwinckel** — *Vinca minor* L.
107 (r). **Borasz** — *Borago officinalis* L.
108 (r). **Odermennig** — *Agrimonia Eupatoria* L.

Synonyme auf 107 (v):
Greci: Agrimonia, Cacocollam.

109 (r). **Garbe** — *Achillea Millefolium* L.

Synonyme auf 108 (v):
Greci: Miliofillon, Schinofillon, Chiliofillon, Stratiotice, Acuillios, Dyoderam; *Latini:* Millefolium, Cereum siluaticum, supercilium veneris; *Galli:* Belis canda, Vicencias.

110 (r). **funff finger krawt** — *Potentilla reptans* L.

Synonyme auf 109 (v):
Greci: Pentafilon, Pentapetes, Pentagonon, Pentadactilon, Pseudoselmon, Pentatomon, Gallopētalon, Xiloton, Assalciton, Pentacynon, Thunatus (oder Thunatich?), Eenpeij asuci, Thebeoci; *Lat.:* pentaphyllum[1]); *Prophetae:* Ibeos, onix, Pteron ibeos, Crimidactilon; *Galli:* Dropedilia; *Latini:* Mang martis; *Daci:* Quinque folium.

111 (r). **Awerhan** — *Antirrhinum Orontium* L.
112 (r). **Wilde Kerbel** — *Umbellif. spec.*
113 (r). **Creutz wurtz** — *Senecio vulgaris* L.
114 (r). **Roszmarin** — *Rosmarinus officinalis* L.
115 (r). **Swertel** — *Iris spec.*
116 (r). **Rijttersporn** — *Delphinium Consolida* L.

[1]) Später hinzugefügt.

117 (r).	**Heydenisch wundtkraudtt** [1])	— *Labiat. spec.*
118 (r).	**Winden**	— *Calystegia sepium* R. Br.
119 (r).	**Stawer**	— *Chenopodium polyspermum* L.
120 (r).	**Gamandra**	— *Veronica Chamaedrys* L.
121 (r).	**Brunkresz**	— *Nasturtium officinale* R. Br.

Synonyme auf 120 (v):
Greci: Cardamon, Cynacoxdomon, Ibers, Cardaria; *Egiptii:* Semen; *Italii:* Nasturcium.

122 (r).	**Dawben cropffe**	— *Fumaria officinalis* L.
123 (r).	**Aggley**	— *Aquilegia vulgaris* L.

Am Ende dieser Publikation möchten wir Dr. H. UITTIEN, Privatdozent für die Geschichte der Botanik an der Reichsuniversität Utrecht, herzlich danken für die wertvollen Bemerkungen, die wir während unserer Arbeit von ihm erhielten.

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[1]) Namen später hinzugefügt.

THE GENERIC TYPE, AND A NEW SPECIES, OF THE BAMBOO GENUS SCHIZOSTACHYUM [1]) FROM JAVA

by

F. A. McCLURE [2])

(Lingnan University, Canton, China).

Thanks to the kind cooperation of Dr. ROBERT PILGER, Director of the Botanical Gardens and Museums at Berlin-Dahlem, I have recently had the privilege of studying and photographing a unique specimen belonging to that institution, which bears the words „Schizostachyum Blumii nobis", in the hand of NEES, the author of the species. Although there are no data on the sheet to indicate its source, or the date of the determination, this presumably represents NEES's type [3]) of this species (which is the type species of the genus). At any rate, the available evidence [4]) points to that conclusion, and the specimen agrees in all respects with NEES' description of the genus and of the type species (NEES, 1829, pp. 534—5). Since the original characterizations are so brief and, since those parts referring to the spikelets are so difficult to interpret, I present here a full description [5]) of the rather fragmentary type specimen.

Schizostachyum Blumei NEES.

Floriferous branches slender, the *internodes* glabrous, smooth to the touch toward the base, rough (siliceous) in the upper half, especially in the areas not covered by the sheath; *leaf sheaths* glabrous, obscurely striate, somewhat compressed toward the apex, the *auricles* very inconspicuous, the *oral setae* poorly developed, the *ligule* short (less than 1 mm long) obscurely scabrous, the apex rounded, the margin smooth [6]); *leaf blade* up to 36 cm long, flat, oblong-lanceolate, acuminate, the tip awn-like, scabrous, the base gently rounded, the secondary nerves 11—14 on each side, scarcely distinguishable from the tertiary, the upper surface entirely glabrous [7]), the lower slightly rough to the touch and apparently glabrous but, under a 20-power binocular microscope, seen to be minutely and sparsely strigose and densely minute-papillose; *inflorescences* consisting of clusters of sessile pseudospikelets at the distal nodes of leafy [8]) or leafless branches, the *pseudospikelets* [9]) up to 27 mm long, slender, the *rachis branches* (axes of pseudospikelets)

glabrous, the terminal segment up to 6 mm long; the *prophylls* up to 5 mm long, ovate-lanceolate, the apex rounded, the keels equal or subequal, sparsely ciliolate or scabrous, rarely glabrous, the *bracts* usually 2, obtuse, glabrous, gemmiferous, I: 5—8 mm long, ovate-lanceolate, the apex usually split [10]), II: 10—15 mm long, oblong-lanceolate, mucronate or short-awned; fully developed, perfect *spikelets* up to 20 mm long, slender, firm, fusiform, gently tapering toward the tip, 1-flowered; *glumes* none; *lemma* tightly convolute, up to 20 mm long in perfect florets, scabrous to strigose toward the apex, and bearing a rather conspicuous tuft of deciduous hairs near each margin, otherwise glabrous, the veins few, somewhat prominent toward the apex, the central one exserted in a glabrous or obscurely scabrous awn, the awn up to 2.5 mm long; *palea* tightly convolute, glabrous, about as long as the lemma, narrowly sulcate, the apex prominently bicornate, the horns strongly tapered, coarsely and sparsely scabrous; normal *rachilla segments* none, prolongation of the rachilla as in the genus; *lodicules* none; *stamens* 6, not exserted, up to 12.5 mm long, the *filaments* ribbon-like, free, about 2.5 mm long, the *anthers* linear, the apex blunt, shallowly notched, the base rather deeply and unequally bifid; *gynaeceum* glabrous, the tip exserted in fully developed florets, the *ovulary* narrow, linear stalked (?), the *style* long, slender, tubular, scarcely distinguishable from the ovulary, the *stigmas* 3, short, plumose, recurved; *fruit* not seen.

A comparison of the rather fragmentary type of this species with numerous ample specimens of *Schizostachyum lima* (Blanco) Merr. from China and the Philippine Islands gives the impression that the two species are very closely related. It is probable, however, that more complete material of *S. Blumei* will reveal additional differentiating characters. The following contrasting features are all that have been discovered thus far:

	S. Blumei (Nees's type)	*S. lima*
Upper surface of leaves	smooth to the touch	rough to the touch
Internodes of branches	entirely glabrous	more or less strigose, ultimately glabrescent
Ligules of culm sheaths	smooth [6])	fimbriate
Inflorescences	dark stramineous	light stramineous
Prophylls of pseudospikelets	shorter	longer
Rachis branches	longer (up to twice as long)	shorter

I wish now to direct attention to a series of nine mounted sheets of a bamboo collected by BLUME on Mt. Salak, Java, and preserved at the National Herbarium (Rijksherbarium) in Leiden. Through the courtesy of Dr. H. J. LAM, Director of the Rijksherbarium, and Dr. J. TH. HENRARD, the Conservator, I have recently had the coveted privilege of studying this fine series of specimens in detail. These specimens are of the greatest interest because Dr. HENRARD, who is thoroughly familiar with the history of the classic collections deposited at the Rijksherbarium, is of the opinion that they represent the collection from which NEES's type of the genus *Schizostachyum* was selected — it is, in other words, the supposed *type collection.* However, beyond admitting that the specimens agree very closely, in their vegetative characters, with NEES's type, and noting that they came from Java, the locality given by NEES (1829, p. 535), I shall not undertake to detail the evidence for this opinion. I shall emphasize, rather, the evidence against it.

In the first place, the sheets in BLUME's series do not bear the name *Schizostachyum Blumei* NEES either in the hand of the author of the name or in that of the collector, BLUME. And in the second place, the spikelets in the supposed type collection are uniformly quite distinct from those in NEES's type from Berlin-Dahlem in a number of characters. The regular occurrence of two functional florets in the spikelets of the Leiden series is, in itself, sufficient to indicate that it is specifically distinct from NEES's type, the spikelets of which are uniformly one-flowered, as described by NEES. And other spikelet characters strengthen the indication of specific distinctness between the two. The differences are brought out more fully in a tabular comparison on page 92 hereinafter.

It will be, I think, immediately obvious to anyone studying this table that NEES's type is specifically distinct from the „type collection" at Leiden. If NEES's type actually was selected from BLUME's series from Mt. Salak, Java, then a mixture certainly happened, probably when the specimens were gathered, the unique specimen sent to NEES certainly having been taken, perhaps inadvertently, from a different plant. — This sort of thing has occurred many times. I recently had occasion to identify some bamboo specimens from a locality in the same geographical area, and I found mixed under the same collector number, and bearing the same vernacular name, not two species merely, but two genera! Furthermore, all of the specimens were in a flowering condition.

Although I have not examined all of the types of the known species of *Schizostachyum* and related genera, I feel reasonably confident, from

a consideration of the characters enumerated in the published descriptions, that Blume's series from Mt. Salak, Java, represents an undescribed species.

Schizostachyum biflorum, sp. nov.

Culmi circa 4 cm crassi [11]); *vaginis culmorum* anguste triangulis, *setis in ore* usque ad 10 mm longis, obscure scabris; *internodiis ramorum* plus minusve scabris vel pubescentibus; *vaginis foliorum* glabris, *auriculis* minutis vel carentibus, *setis in ore* obscure scabris, erectis, usque ad 10 mm longis, *ligula* usque ad 2.5 mm longa, scabra, longe fimbriata, fimbriis usque ad 4 mm longis, laevibus; *petiolo* usque ad 10 mm longo, crasso, glabrescente vel supra basem minute scabro; *pseudospiculis* in nodis rare solitariis, plerumque plus minusve dense congestis; *rachi* usque ad 10 mm longa, glabra vel sparse scabra; *prophyllis* parvis, usque ad 2 mm longis, carinis ad apicem conspicue ciliatis; *spiculis* usque ad 18 mm longis, bifloris; *floribus* dissimilibus; *glumis vacuis* carentibus; *lemmatibus* paucinervis, apice carinatis, subulatis, *lemmate* in flore inferiore 7—8.5 mm longo, laxe convoluto, in flore superiore 10—11.5 mm longo, stricte convoluto, *palea in flore inferiore* usque ad 13 mm longa, longe exserta, laxe convoluta, late sulcata, sulco apice sparse hirsuto, 2-carinata, carinis praesertim ad apicem scabris, apice truncata, obscure emarginata; *palea in flore superiore* usque ad 13 mm longa, parve exserta, stricte convoluta, anguste sulcata, apice obscure bifida et scabra; *rachillae segmento* floris inferioris usque ad 4.5 mm longo, glabro, nitido, curvato, compresso, in marginibus versus apicem expansum conspicue ciliato; reliquis ut in genere.

In the English description that follows I have given, for the benefit of those who may feel skeptical as to the generic disposition of this species, a rather full consideration of its characters, without eliminating those which are obviously of generic rank.

Culms as thick as the arm („armdikker bambu", teste Blume [11]); *culm sheaths* [12]) deciduous, narrowly triangular, truncate, with poorly developed *auricles*, obscurely scabrous [13]) *oral setae*, a fimbriate, scabrous *ligule* and a reflexed, linear-lanceolate, subulate *sheath blade*, the latter with its upper surface more or less densely strigose; *branches* slender, fasciculate, usually subequal, rarely with one somewhat longer and stouter than the others (up to 50 cm), only sparingly rebranched, sometimes bearing leaves below the distal floriferous nodes, the *basal internodes* scabrous or pubescent throughout, or glabrous at their bases and sparsely appressed-pubescent and glabrescent toward their tips, the *distal internodes* of branches and branchlets retrorsely scabrous; *branch*

sheaths somewhat persistent, the *blades* of those at the upper nodes progressively more tardily deciduous, and more awn-like in form; *leaves* variable [14]), those associated with inflorescences smaller and more delicate than those described here, which were produced on sterile branches; *leaf sheaths* up to 7 or more to a branchlet, thick, compressed toward the apex, glabrous or glabrescent, obscurely striate, the *auricles* poorly developed, usually entirely lacking in the lower ones, the *oral setae* borne both on the auricles and at either side of them (present whether the auricles are visibly developed or not), numerous, slender, erect, usually straight, up to 10 mm long, pale, obscurely scabrous [13]), the *ligule* well developed, truncate, scabrous or velutinous, up to 2.5 mm long (not including the fimbriae) the nearly straight margin long-fimbriate, the fimbriae smooth, pale, very slender, straight, up to 4 mm long; *leaf blade* up to 40 cm long and 7.5 cm wide, broadly lanceolate, acuminate, with a long, slender, scabrous, subulate tip, somewhat plicate, the upper surface glabrous, the lower glabrescent, or sometimes remaining sparsely pubescent along the margin and near the base, paler green than the upper, the *secondary veins* 10—13 on either side, the tertiary 7—9 in each space, several tertiary veins along the outer edge of the blade scabrous on the upper surface, transverse veinlets clearly visible in young leaves, scarcely so in the older ones, the *petiole* up to 10 mm long, stout, minutely pubescent (sometimes glabrescent) on the upper surface at the base; *inflorescence* variable, consisting of more or less dense clusters of pseudospikelets [15, 9]), the *rachis branches* [16]) slender, up to 10 mm long, each borne in the axil of a sheath or bract and bearing at its base, first a small prophyll, then several gemmiferous bracts, and finally a 2-flowered spikelet, the internodes of variable length (the penultimate one longest in those examined), glabrous or sparsely retrorse-scabrous, flattened above the point of insertion of the buds, the apex (the point of insertion of the spikelet) expanded, cupulate, usually more or less oblique, the *prophylls* small, thin, 1.5—2 mm long, broad, obtuse, the keels winged, ciliate, the cilia conspicuously tufted at the apex, the *bracts* usually 3, persistent, gemmiferous, the lowest one often split at the tip by the pressure of the developing bud inside, about 5 mm long, thinnish, few-nerved, obtuse and minutely apiculate, the successively higher ones approaching the lemma in size, shape, texture and venation; *empty glumes* lacking; *spikelets* 2-flowered, up to 18 mm long in those examined, the less well-developed (progressively sterile) ones proportionately smaller; the two *florets* dissimilar [17]), rather variable as between the different pseudospikelets studied; lemmas firm in texture, ovate-lanceolate,

acute or obtuse, apiculate to subulate, several-nerved, the mid-nerve prominent toward the tip, *the lemma of the lower floret* 7—8.5 mm long, loosely convolute, *that of the upper floret* 10—11.5 mm long, tightly convolute; *the palea of the lower floret* up to 13 mm long, long-exserted, chartaceous to somewhat firm, loosely convolute, broadly sulcate, the lower portion of the sulcus occupied by the normal rachilla segment, the upper portion coarsely scabrous, 2-keeled, the keels scabrous, especially toward the narrow, truncate or rounded, obscurely emarginate apex; *the palea of the upper floret* up to 13 mm long, slightly exserted, thin and membranaceous below, increasingly indurate toward the obscurely bifid apex, tightly convolute, narrowly sulcate, the sulcus occupied, usually throughout its length, by a slender, glabrous, shining, bristle-like *prolongation of the rachilla,* the latter often bearing a minute rudiment of a floret; *normal rachilla segment* (at the back of the palea of the lower floret) up to 4.5 mm long, curved, glabrous and shining, strongly flattened, gradually narrowed, the edges scabrous, toward the base, and bearing on one or both margins a prominent fringe of cilia toward the expanded, excavate apex; *lodicules* lacking; *stamens* 6, included, the *filaments* 1 mm long, ribbon-like, the *anthers* 4—5 mm long, slender, linear, the apex blunt or obscurely bifid, the base deeply and unequally 2-lobed; *gynaeceum* up to 10 mm long, slender, the *ovulary* glabrous throughout, very narrow, the *style* long, slender fistulose, stiff, somewhat angular, the *stigmas* 3, usually exserted, short, plumose, purplish; *fruit* not seen.

The foregoing description was prepared from nine specimens in the Rijksherbarium at Leiden, all with notes in the handwriting of the collector, Blume, but without dates or collector numbers. Each sheet, however, bears a distinctive accession number in the Rijksherbarium series, to which the initials HLB (Herbarium Lugduno-Batavum) are prefixed. The HLB numbers of the sheets are: 908.84 — 909 (floriferous branches only), 908.84 — 948 (floriferous branches only), 908.84 — 971, the nomenclatural type (floriferous branches with culm sheaths), 908.90 — 827 (floriferous branches only), 908.100 — 74 (inflorescences, with leaves associated on some of the branches), 909.65 — 236 and 909.65 — 237 (leafy, vegetative branches only), and 909.67 — 87 (floriferous branches only). Vernacular name, *Bambu Tamian* or *B. Tamiang* (sundanese); leg. in October at the type locality, Mt. Salak, Java (near Buitenzorg, Blume's place of residence).

The sheet bearing HLB number 908.84 — 971 is designated as the *nomenclatural type* (Briquet, p. 3, Art. 18).

Comparison of the lower and upper florets of the spikelet in *Schizostachyum biflorum.*

	Lower floret	Upper floret
Insertion	borne on the terminal segment of a rachis branch; abscission more prompt	borne on a rachilla segment; abscission less prompt
Lemma	shorter (7—8.5 mm) loosely convolute	longer (10—11.5 mm) tightly convolute
Palea	loosely convolute, obviously 2-keeled, broadly sulcate, the sulcus occupied below by a normal rachilla segment, and coarsely scabrous above, the keels scabrous toward the broad, truncate, emarginate apex	tightly convolute, obscurely 2-keeled, narrowly sulcate, the sulcus occupied throughout by a slender, briste-like prolongation of the rachilla, finely scabrous toward the narrow, obscurely bifid apex

This species is apparently most closely allied, in its vegetative characters at least, to *Schizostachyum Blumei* and *S. lima.* It is readily distinguishable from these species, however, by the spikelet characters, as is shown in the following tabular comparison:

	Schizostachyum Blumei (NEES's type specimen) and *Schizostachyum lima*	*Schizostachyum biflorum* (BLUME's series at Leiden)
Prophylls of the pseudospikelets	longer, the cilia on the keels less prominent, sometimes entirely lacking	shorter, the cilia on the keels more prominent, each keel with a conspicuous tuft of cilia at its apex
Spikelets	compact, uniformly 1-flowered	loose, uniformly 2-flowered
Normal rachilla segments	lacking	one, up to 4.5 mm long
Lemmas	up to 20 mm long, tightly convolute	in the flower floret, up to 8.5 mm long, loosely convolute; in the upper floret, up to 11.5 mm long, tightly convolute

	Schizostachyum Blumei (Nees's type specimen) and *Schizostachyum lima* (cont.)	*Schizostachyum biflorum* (Blume's series at Leiden) (cont.)
Paleas	about as long as the lemma, tightly convolute, narrowly sulcate, not conspicuously keeled, the apex prominently bicornate	in the flower floret, up to 13 mm long, long-exserted, loosely convolute, broadly sulcate, conspicuously 2-keeled, the apex truncate and obscurely emarginate; in the upper floret, up to 13 mm long, visibly exserted, tightly convolute, narrowly sulcate, not conspicuously keeled, the apex truncate, obscurely bifid

The enumeration of the vegetative characters by means of which these three species may be distinguished must be deferred until those of *S. Blumei* and those of *S. biflorum* are more fully known.

Acknowledgements.

In addition to acknowledgements made in the foregoing text, I wish to enumerate certain other obligations. It is a pleasure to acknowledge the assistance derived through discussions of various aspects of this interesting subject with Mrs. Agnes Chase, Associate Agrostologist of the Division of Plant Exploration and Introduction, of the Bureau of Plant Industry, the U. S. Department of Agriculture. The photograph of the nomenclatural type of *Schizostachyum biflorum*, and the line drawings (from my pencil sketches) were made by the technicians at the Rijksherbarium, under the supervision of Dr. Henrard. For permission to reproduce the photograph of Nees's type, I am obligated to the Division of Plant Exploration and Introduction, of the Bureau of Plant Industry, the U. S. Department of Agriculture. Furthermore, I am indebted to the Board of Directors, and the Board of Trustees, of Lingnan University, for the extension of my leave of absence, which made possible the visit to Leiden. To the Rockefeller Foundation I am indebted for financial

assistance which has made possible the assembling of the necessary literature bearing on this and other problems relating to the Oriental bamboos.

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NEES AB ESENBECK, C. G. — 1829 — Agrostologia Brasiliensis, 534—535.

Footnotes.

1. Paper from the Lingnan Natural History Survey and Museum, Lingnan University, Canton, China.
2. Curator of Economic Botany, L. N. H. S. M., and Professor of Botany, Department of Biology, Lingnan University (on leave, 1933—1936).
3. Until recently I had not been able to locate the actual type of *Schizostachyum Blumei* NEES. Upon the discovery of BLUME's supposed type collection at Leiden last summer, I prepared a revised description of the genus *Schizostachyum* to include this latter species, which is characterized by 2-flowered spikelets. That paper is being published in the Lingnan Science Journal (MCCLURE, 1936). From the statements therein it is clear that I was under the impression that the plant represented by BLUME's collection at Leiden was conspecific with NEES's type, although it did not agree in the spikelet characters with NEES's description. I attributed the discrepencies to the fact of the confusing nature of the inflorescences in this genus, imputing to NEES faulty observation of which he was not guilty, though anyone will admit that his description is somewhat vague, to say the least. And certainly it does not convey a clear impression of the inflorescence characters to one not already thoroughly familiar with this genus. The addition to the generic description are appropriate enough, but my faulty interpretation of BLUME's collection as conspecific with NEES's type must be kept in mind in reading the associated text.
4. This is the only sheet of this species which has come to light which bears the name *Schizostachyum Blumei* in NEES's own hand. There are two envelopes attached, each containing dissections of portions of the inflorescence. One is labeled, in NEES's hand, „spicula 1.''

5. This description will probably have to be modified more or less, and certainly will have to be supplemented, when living plants of the species have been studied. The observations of microscopic details recorded were made with the aid of a binocular microscope fitted with lenses giving a magnification of 20 diameters.
6. The margin of the ligule in this genus is very commonly fimbriate at first, and may become smooth in age by weathering or other agency. The smooth condition of the obviously weathered ligules in NEES's type is no certain indication that they were not fimbriate originally.
7. The surface outgrowths, as well as other foliar characters, are extremely variable in this genus, and should receive only minor emphasis as criteria for distinguishing species.
8. One floriferous twig bears leaf sheaths from which the blades have fallen.
9. Special attention is directed to the importance of these units, in this genus and related genera, as affording the only clue to an understanding of the development of the inflorescence and its variable expression. An important feature of these pseudospikelets is the exceedingly variable nature of their different component elements, more especially those of the spikelets by which they are terminated. The spikelets may be perfect, and promptly deciduous, on the relatively earlier pseudospikelets (rachis branches of relatively lower order) but are progressively les well developed, and ultimately sterile, on the relatively later ones (rachis branchs of relatively higher order). Furthermore, the relative size, shape and other features and relationships of the lemmas and paleas of given florets change in correspondence with this progressive degeneration of the pseudospikelets. It should be added that the prophylls and bracts of the pseudospikelets are also variable in size and texture, those on relatively later ones being relatively smaller in size and more delicate in texture.

   It is pointed out, and should be kept in mind, that the description here given is based on a study of the most fully developed pseudospikelets *available* in the specimen cited. Since the *most fully developed* perfect spikelets are very promptly deciduous, these have not been seen. Evidence of their loss is to be seen in the presence of the empty rachis tips from which they fell. Subsequent study of fresh material should, therefore, reveal further data on these characteristic, but very elusive structures.
10. NEES (1829, p. 534, under „Observ. III.'') where he says (line 14 from the bottom): „gluma inferior minor, obtusa, bifida, ...'' must have been referring to this feature.
11. BLUME's expression, „armdikker'' (thick as the arm), written on one of the field labels, probably refers to the thickness of the arm at the wrist. No culm specimen of the other species I have seen exceeds this size. Furthermore, the greatest culm thickness recorded for any species of this genus, to my knowledge, is that of *S. Hallieri* GAMBLE, which is 4 cm.
12. The culm sheaths are represented only in HLB 908.84 — 971, by two small, weathered examples loosely attached to the upper nodes, only one of these being sufficiently well preserved to reveal the general characters given.
13. The scabrousness scarcely visible with an ordinary 8-power hand lens, but clearly discernible under a binocular microscope giving a magnification of 20 diameters.

14. Only HLB 908.100 — 74 has leaves associated *on the same twigs* with inflorescences. Here the blades of the larger ones (probably developed during the vegetative stage of the plant) have fallen, those remaining (on other floriferous twigs) having blades up to 34 cm long and 4—5 cm wide, with correspondingly smaller sheaths, slightly less well developed oral setae and ligular fimbriae, but otherwise identical with those of the sterile specimens, HLB 909.65 — 236 and 237, on which my leaf descriptions have been based.
15. These at first solitary at the nodes of primary or secondary branches and twigs, but soon, by development of their basal buds into new pseudospikelets, they become increasingly numerous and crowded, ultimately forming dense, subglobular heads.
16. No attempts is made here to distinguish between the first, or primary, rachis, and the rachis branches of relatively higher order, as no constant difference, except a minute difference in size, has been noted.
17. See tabular arrangement of contrasting features of the lower and upper florets which follows the description.

Illustrations.

1. Photograph of *Schizostachyum Blumei* NEES, the nomenclatural type at Berlin-Dahlem.
2. Photograph of *Schizostachyum biflorum* sp. nov., the nomenclatural type at Leiden (HLB 908.84 — 971).
3. Sketch showing a pseudospikelet of *Schizostachyum Blumei* NEES (× 2½) from the type.
4. Sketch showing spikelet of same (× 5) from the type.

4*a*. Sketch showing palea of same, with prolongation of rachilla, and stigmas (× 5) from the type.

The following line drawings all from *Schizostachyum biflorum* sp. nov.:

5. Well developed pseudospikelet representing a primary branch of the rachis (from HLB 908.84 — 971).
6. Schema of the structure of the foregoing.
7. A poorly-developed pseudospikelet (from HLB 908.84 — 909).
8. Schema of same.
9. Prophyllum from same.
10. Spikelet, showing the two florets (from HLB 908.84 — 971).
11. Lemmas of the lower (*a*) and upper (*b*) florets, respectively, of the same.
12. Paleas of the lower (*a*) and upper (*b*) florets, respectively, of the same.
13. Rachis branch (axis of pseudospikelet) stripped of its appendages (from HLB 908.84 — 909).
14. Normal rachilla segment (at back of lower floret) (from HLB 908.84 — 971).
15. Prolongation of the rachilla (at back of upper floret) (from HLB 908.84 — 971)
16. Culm sheath (enlarged) from upper node (HLB 908.84 — 971).
17. Apex of leaf sheath and insertion of petiole (from HLB 909.65 — 237).

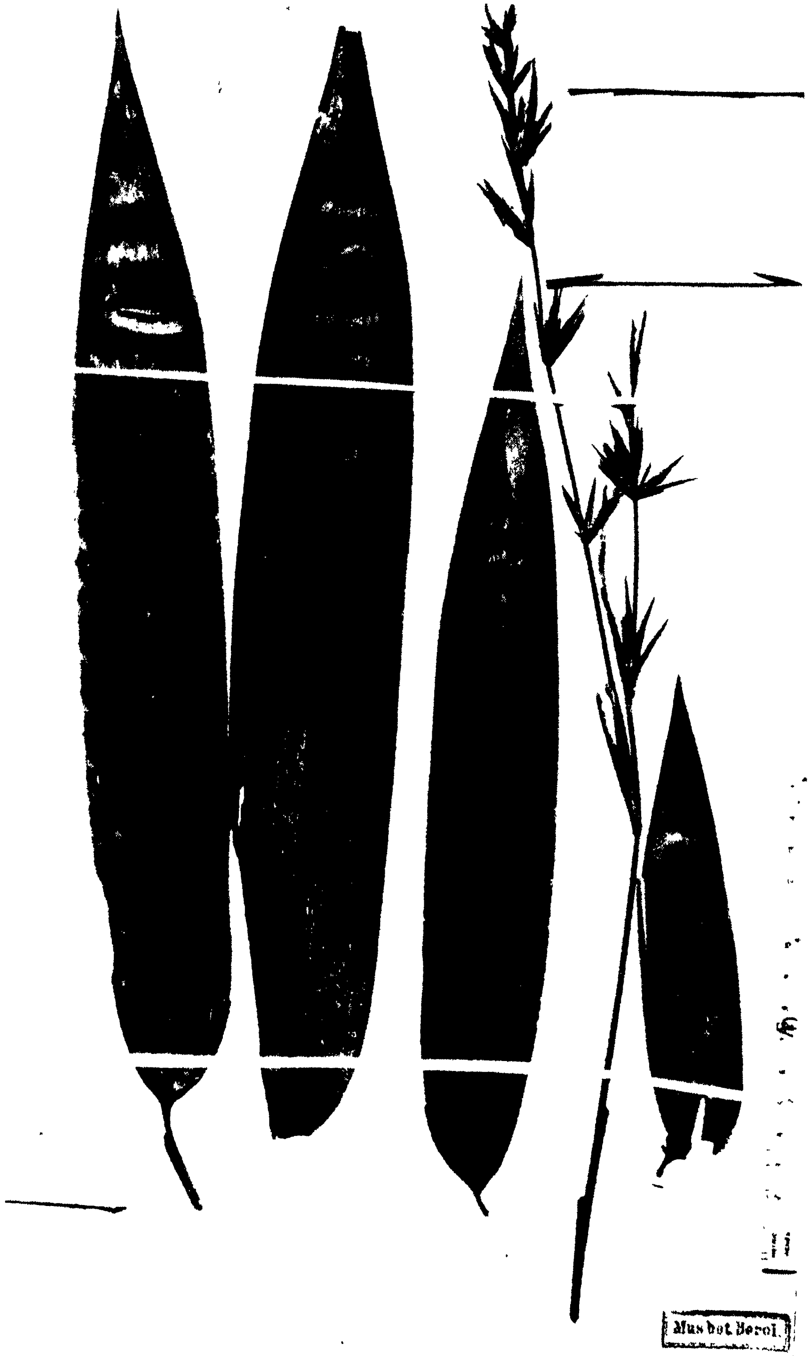

Fig. 1.


HERB. LUGD. BAT.
Herb. Lugd. Bat.
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Fig. 2.

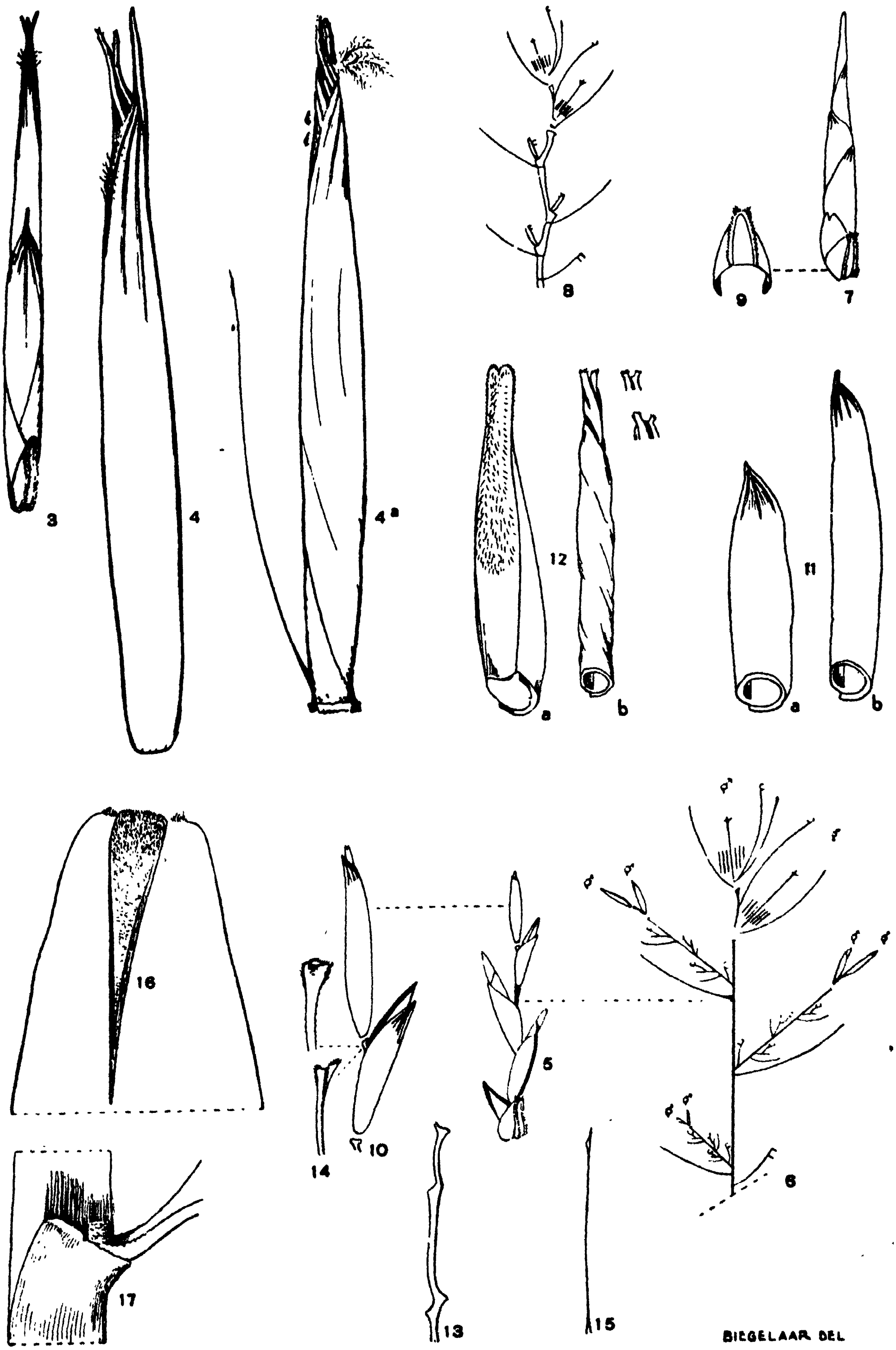

Fig. 3—17.

ON DECALOBANTHUS, A NEW GENUS OF CONVOLVULACEAE FROM SUMATRA

by

S. J. VAN OOSTSTROOM

(Leiden).

Being occupied with studies on the *Convolvulaceae* of Netherlands India I met with a remarkable specimen in the Buitenzorg Herbarium, collected by Dr. O. POSTHUMUS during the expedition in Djambi (Sumatra) in the year 1925. At first sight this plant seemed to be a *Merremia*. A closer examination, however, soon showed some important differences with that genus, especially in respect to the corolla, which has a long, narrow and rather fleshy tube and a limb with 5 short, reflexed (or patent?) lobes. Each lobe is deeply bifid, so that the limb appears 10-lobed. The middle part of the lobes is fleshy just as the tube; it corresponds with a midpetaline field of the corolla of most genera of *Convolvulaceae,* the lateral parts of the lobes (lobules) are much thinner, membranaceous and nerved. They represent the interpetaline fields of the Convolvulaceous corolla. In general there is a resemblance with the essential corolla construction of many species of *Erycibe,* where the lobes are also bifid and possess a thick middle part and two membranaceous lobules. The lobules in the new genus are not fully equal in size, those on the right of each lobe, as seen from the inside of the corolla being always slightly larger. The corolla is fully glabrous or bears some papillae at the base of the filaments. The pistil has a two-celled ovary, each cell with 2 ovules and bears a long, filiform style with two globular, papillose stigmas, exactly as in *Merremia.* I suppose this plant to be closely related to that genus, but as the corolla with its fleshy tube and remarkable lobes is so different from all other species, it is impossible to incorporate it in *Merremia* without important alteration of the generic limits. I, therefore, propose to establish a new genus, under the name of ***Decalobanthus*** (derived from δεκα, ten, λοβος, lobe and ἀνθος, flower).

Decalobanthus, nov. gen.

Planta herbacea, glaberrima, *caulibus* procumbentibus, gracilibus. *Folia* ovata, apicem versus attenuata, basi truncata vel subretusa. *Inflorescentiae* axillares, pedunculatae, 1- vel 2-florae, pedicelli subangulati, apice paullo incrassati. *Sepala* majora, subaequalia vel exteriora paullo breviora, ovata vel elliptica, obtusa vel subemarginata. *Corolla* hypocrateriformis, tubo crasso, longe anguste obconico vel cylindrico, basi attenuato, enervoso, limbo 5-lobato, lobis reflexis (vel patentibus?), parvis, bifidis, medio crassioribus, lobulis oblongis, obtusis, membranaceis. *Stamina* in tubum corollae inserta, *antheris* oblongis vel ovatis basi sagittatis, *filamentis* applanatis, basin versus sensim dilatatis. *Pollen* inermis. *Ovarium* 2-loculare, glabrum, loculis 2-ovulatis, *stylo* filiforme, indiviso, *stigmatibus* 2, globosis, papillosis. *Discus* cylindricus, obscure lobatus. *Fructus* ignotus.

Typus generis: *Decalobanthus sumatranus* n. sp.

Decalobanthus sumatranus, nov. spec.

Planta herbacea, glaberrima, *caulibus* procumbentibus, teretibus, fistulosis, 1—2 mm crassis. *Folia* petiolata, petiolis laminis brevioribus, 10—17 mm longis, ovata vel anguste ovata, apicem versus sensim attenuata, acumine obtuso, mucronulato, basi truncato vel paullo retuso, 4—6 cm longa, 2—4 cm lata, supra subnitida, subtus pallidiora, nervo mediano nervisque primariis 6—7 utrinque prominentibus, nervis secundariis subparallelis, nervis tertiis reticulatis. *Inflorescentiae* axillares, 1—2-florae, pedunculi striati vel angulati, 1.5—3.5 cm longi; pedicelli subangulati, apice incrassati, 10—15 mm longi. *Sepala* ad 19 mm longa, subaequalia vel exteriora paullo breviora, valde concava, exteriora 2 ovata, subemarginata, obsolete mucronulata, coriacea, interiora 3 elliptica, subemarginata vel obtusa, obsolete mucronulata, coriacea, margine scariosa. *Corolla* flava, hypocrateriformis, tubo longe et anguste obconico vel cylindrico, basi attenuato, subcarnoso, ad 2.5 cm longo, limbo 5-lobato, lobis parvis, reflexis (vel patentibus?), bifidis, medio crassioribus, lobulis membranaceis, oblongis, obtusis, subinaequalibus, circiter 5—5.5 mm longis, striatis. *Filamenta* circiter 6.5 mm supra basin corollae inserta, applanata, basin versus sensim dilatata, glabra vel basi papillosa, circ. 5 mm longa; *antherae* oblongae vel ovatae, 6 mm longae, basi breviter sagittatae. *Ovarium* 2-loculare, conicum, glabrum, loculis 2-ovulatis, *stylo* filiforme, ad 16 mm longo, *stigmatibus* 2, globosis, papillosis. *Discus* cylindricus, 1.25 mm altus, obscure lobatus.

MALAY ARCHIPELAGO: Sumatra, *Djambi*, near Bangko, along road

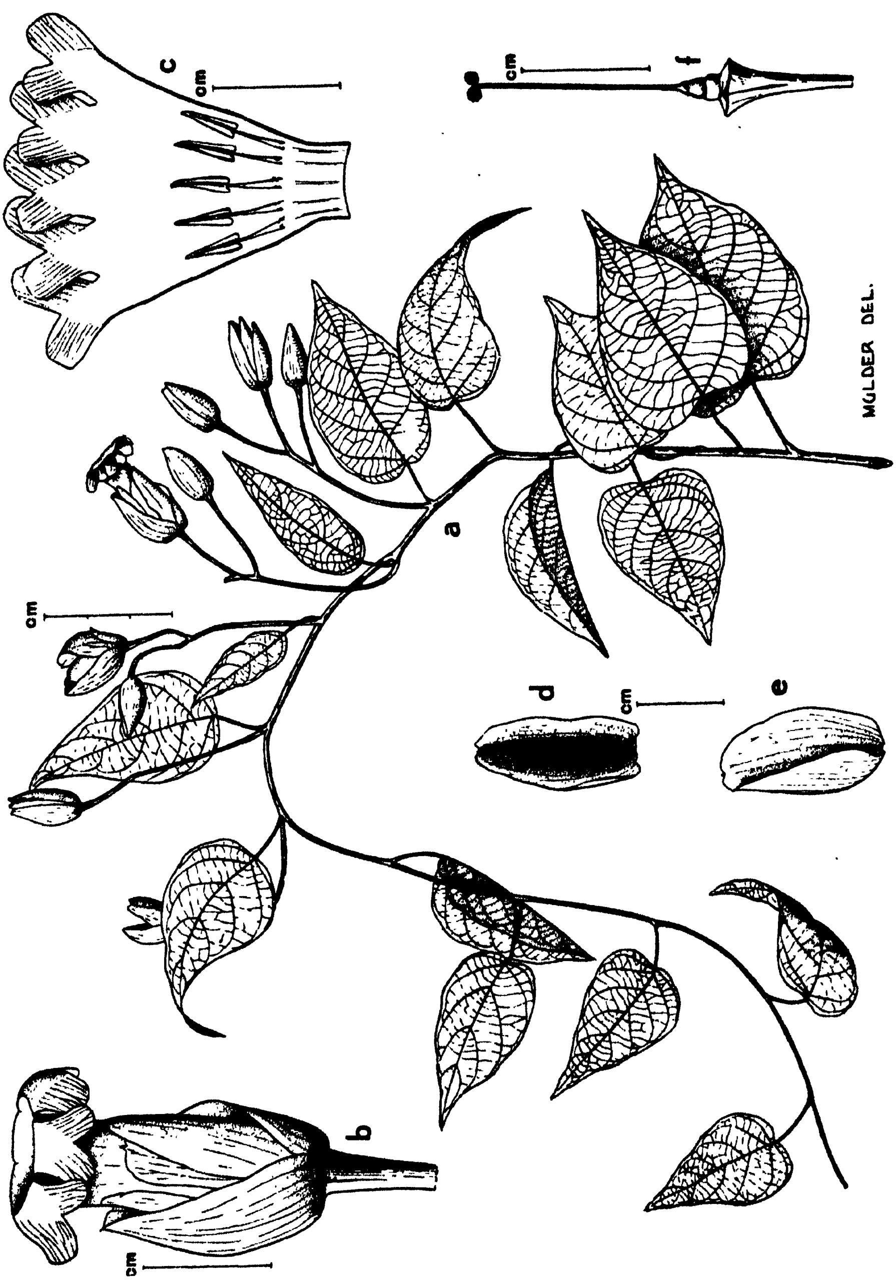

Fig. 1. — *Decalobanthus sumatranus* v. Ooststr. n. sp., *a*: branch of the type-specimen, Posthumus 571; *b*: flower (I am not sure whether the corolla lobes are spreading or reflexed); *c*: corolla, laid open, schematically; *d*: sepal 1, inside; *e*: sepal 3, inside; *f*: pistil.

to Korintji, 60 m alt., open sunny place on weathered tuff, creeping; fls. yellow, stamens white; July 18, 1925, leg. Dr. O. Posthumus 571 (type in the Buitenzorg Herbarium).

V e r n a c u l a r n a m e: Akar tanah (akar = root, tanah = soil).

THE TAXONOMY AND NOMENCLATURE OF RUTACEAE-AURANTIOIDEAE [1])

by

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From the time of CORREA DE SERRA (1805), MIRBEL (1813), DE JUSSIEU (1815), ROEMER (1846), BAILLON (1855), and OLIVER (1861), a great stress is laid upon the number of stamens, locules, and ovules to the primary classification of the *Rutaceae-Aurantioideae,* but the importance of the presence of an inflorescence and its reduction of the number of flowers, the pinnate leaf and its reduction of the number of leaflets, venation of the leaf, its conspicuousness and the construction, the origin and development of the wing upon the rachis and the petiole, the number and the nature of thorns upon the branches, the fundamental number of the floral organs and its increase or decrease, the formation of pulp vesicles, the hardening of the rind of fruits, and other points affecting the universal affinity of plants as a whole, have been quite neglected in the past, the consideration of which would have helped the orderly development of the taxonomy of the subfamily. It is clear that the increased number of the floral organs and the development of the pulp vesicles are undoubtedly very important systematic features of the subfamily, but such are those out of many significant characteristics which take part in the classification of the whole group. A character like the increase or decrease of the number of locules, for instance, can occur even within one genus, as in the well-known case of *Citrus* and *Fortunella.* The ovules may be single, or binary, either superposed or collateral, or otherwise numerous in uni-, or biseriate arrangement: the gradation of this character is also continuous, as in the case of *Triphasia, Merope* and *Wenzelia,* all having similar floral characteristics but the last only has biseriate ovules. Unquestionably, the biseriate character is derived from collateral arrangement which is commoner in rather advanced groups. The increase of the number of filaments more than ten,

[1]) Contributions from the Horticultural Institute, Taihoku Imperial University, No. 17.

occurs also in tribes not closely related, as *Aegle* (also *Feroniella,* and *Balsamocitrus* Section *Afraegle*), *Oxanthera,* and *Citrus* (also *Poncirus* and *Fortunella*), but the true pleiotaxy of stamens occurs only in *Aegle* and in the Section *Citrophorum* of the genus Citrus. The pulp-vesicle formation is also seen in various tribes widely divergent from each other, such as *Aegleae-Swingleinae (Swinglea), Lavangeae (Pleiospermium), Atalantieae (Atalantia* and *Severinia*), *Microcitreae (Microcitrus, Eremocitrus, Monanthocitrus* and *Pleurocitrus), Aurantieae-Citropsinae (Citropsis),* and *Aurantieae-Citrinae (Poncirus, Citrus* and *Fortunella).*

It is very clear that the starting point of the subfamily is represented by *Micromelum* and *Glycosmis,* both having pinnate leaves with alternate leaflets and unwinged rachis, many-flowered inflorescences, an ovary with less than 5 locules and one or two superposed ovules in each locule. Having dry fruits and contortuplicate cotyledons, *Micromelum* forms the most primitive tribe *Micromeleae,* somewhat analogous to the *Rutoideae-Cusparieae* of tropical America. The genera *Glycosmis, Murraya* and *Clausena,* altogether forming the tribe *Clauseneae,* have fleshy fruit, plano-convex cotyledons and unarmed branches with pinnate leaves, resembling the *Micromelum* in general appearance of the plant. It is worthy of note that the great reduction of the number of leaflets is seen in such species, as *Micromelum diversifolium* MIQ., *Clausena Guillauminii* TANAKA, and *Murraya stenocarpa* TANAKA (= *Chalcas stenocarpa* TANAKA), and the alate rachis is found in *Clausena Wallichii* OLIV., *C. Guillauminii* TANAKA and *Murraya alata* DRAKE. The reduction of the number of locules in *Murraya* is also to be noted. No thorn-bearing plants occur in these tribes, except in the doubtful species, *Clausena impunctata* HIERN, which has curved paired axillary spines, almost entirely opposite leaflets, and a distinctly winged rachis. The gradation of this tribe into the next tribe *Aegleae,* having hard-shelled fruits, is seen in the Malayan genus *Merrillia,* which has large flowers, reminding of *Murraya* (Subgen. *Euchalcas* TANAKA), and a winged rachis like *M. alata,* mentioned above.

The tribe *Aegleae* is characterized by the woody rind of the fruit, a large number of locules and ovules, frequent occurrence of trifoliolate leaves, occasional presence of appendages at the bottom of the filaments, resembling some members of the family *Simarubaceae.* The development of thorns of different type is first definitely seen in this tribe, as shown by curved paired thorns, like some members of the subfamily *Toddalioideae,* and in *Feroniella pubescens* TANAKA; straight double thorn in *Aegle* and *Balsamocitrus*; and straight single thorn in *Feronia,* and *Feroniella*

lucida SWINGLE. Oppositely pinnate leaves are first seen in this tribe, but in the preceding tribe, the tendency of becoming so in alternately pinnate species, like *Glycosmis pentaphylla* CORR., or *Clausena dentata* var. *robusta* TANAKA, is occasionally noticed. It is unquestionable that this tribe has manifold relationship to other tribes as shown by various instances, such as the great resemblance of *Aeglopsis* with *Pamburus* (Tribe *Lavangeae*) in the nature of the leaf and thorn, *Balsamocitrus* with *Lavanga* (Tribe *Lavangeae*) in various characters, and *Swinglea* with *Pleiospermium* (Tribe *Lavangeae*), also in general characters and especially in the shape and construction of the pistil. The tribe is divided into four subtribes: (1) *Merrillinae,* having alternately pinnate leaves with narrowly winged rachis, normal filaments, a long-stalked and many-ovuled quinquelocular ovary, (2) *Feroniinae,* having oppositely pinnate leaves with or without wing upon the rachis, slightly narrowed ovary at the base, appendaged filaments, and five, finally uniting locules, (3) *Balsamocitrinae,* having unifoliate or trifoliate leaves with unwinged or rudimentally fringed petiole, normal filaments, and a more than 6-loculed ovary sitting on the distinct disk, and (4) *Swingleinae*, having trifoliolate leaves with narrowly fringed petiole, normal filaments, stalked hairy ovary with many locules, and numerous hairy seeds. The double number of filaments is found in *Feroniella* and in the subgenus *Afraegle* of the genus *Balsamocitrus,* but stamens are very numerous in *Aegle*. Hairiness of seeds is only found in *Aegle* and *Swinglea.*

It is next obvious that the main line of the subfamily, with soft-skinned fruits, develops into the oppositely pinnate-leaved Section *Aurantieae,* but there is a large side line which has a consistent tendency of reducing the number of leaflets. Among the latter, the tribe *Lavangeae* is related in many ways with the former tribe *Aegleae* in habit, as mentioned before, and the climber genus *Lavanga* has more or less hardened fruit rind. Obscurity of venation of leaves is also found in both tribes, as instanced by *Balsamocitrus Dawei* STAPF, *Aeglopsis, Pamburus* and *Lavanga.*

Trifoliolate-leaved members predominate in the tribe, but *Pamburus* and *Pleiospermium littorale* TANAKA have unifoliate leaves. All members of this tribe have an ovary with 2 to 3, or 4 to 5 locules, each containing 1 to 2 ovules. *Lavanga* still has superposed ovules, and *Pleiospermium* has collateral or obliquely superposed ovules. The tendency of reducing the number of leaflets, however, develops into the large unifoliolate group including three closely related tribes *Meopeae, Atalantieae* and *Microcitreae,* which are rather greatly divergent from the pinnate-leaved

group, descended straight forward from *Clausena*. Among these tribes, trifoliolate members rarely occur, as *Triphasia trifolia* P. WILS., but it does not amount much, as *T. grandiflora* MERR. of the same genus, is distinctly unifoliate. The big difference of the tribe *Meropeae* from the tribe *Lavangeae* is the reduction of the number of flowers, but still a great majority of the genera of *Meropeae* have a 3- or 5-loculed ovary with one or two ovules, except in *Wenzelia*, which has locules more than 5 and biseriate ovules. Obscure venation of leaves is also frequent in the tribe *Meropeae*, though the general appearance of the genus *Wenzelia* very much approaches *Monanthocitrus* of *Microcitreae*. Binary thorns frequently occur in this tribe (*Triphasia* and *Echinocitrus*), but single thorns, either straight or curved, are also frequently seen. The genus *Paramignya* has a 3—5-loculed ovary with obliquely superposed ovules, somewhat like the case of *Lavanga*, and it is curious that both are climbing vines with curved simple thorns. No increase in the number of stamens and the formation of pulp-vesicles is found in this tribe.

In the next tribe *Atalantieae*, paniculate inflorescences predominate and still the unifoliolate tendency is very strong. Venation of the leaf is quite different from the former tribes, as veins are very frequently forming parallel netting. This characteristic is bringing down into the next tribe *Microcitreae*. In these tribes, pulp vesicles develop commonly, except in *Oxanthera*, in which stamens count more than ten and locules, more than five in number, containing many ovules, as in *Citrus* and its near members. Simple thorn predominates in these two tribes, but binary thorns are seen in *Monanthocitrus* and *Pleurocitrus inodora* TANAKA (*Citrus inodora* BAIL.).

Coming back from these unifoliolate tribes, the pinnate-leaved tribe *Aurantieae* plays an important role to the further development of the subfamily. This tribe is characterized by the great development of oil cells on the ovarial wall, common presence of wings on the rachis and petiole, and distinct broad reticulation of the leaf. Its subtribe *Hesperethusinae* is linked to certain extent to *Clausena* in having subulate filaments, thick short anthers, and dwarf styles, but it approaches more closely the African subtribe *Citropsinae*, having similar oppositely pinnate leaves, and a large oil-celled ovary containing a single ovule. The latter tribe approaches in turn to the subtribe *Citrinae* quite closely, in the leaf characters, vesiculate locules, and even in grafting affinity. The reduction of the pinnae in *Citropsis* is quite frequent, and even a unifoliolate species was found (*Citropsis citrifolia* TANAKA), which looks almost like *Citrus* in general appearance. Even in *Citrus*, trifoliolate individuals are occasionally found,

and from the progeny of a cross between *Citrus* and the trifoliolate genus *Poncirus* (Subtribe *Poncirinae*), a pinnate-leaved individual has arisen, so that the subtribe *Citrinae* probably has a pinnate-leaved member, like *Citropsis*, as its near ancestor. The paniculate inflorescence is also bringing down into a group of *Citrus* (Subgenus *Archicitrus*), and the solitary-flowered genera *Poncirus* and *Fortunella*, as well as a similar group of *Citrus* (Subgenus *Metacitrus*), are unquestionably later creations, as in the quite analogous case of *Severinia* versus *Atalantia*, with respect to the lack of paniculate inflorescences. It is also interesting to note that these solitary-flowered members are geographically more subordinate to China than to India. Double thorns are still present in *Citropsis* and no increase in the number of filaments occurs, though pulp vesicles are more or less well developed. This again tells, as in the case of *Oxanthera*, that the increase of the number of filaments, ovary and ovules, does not go parallel with the formation of the pulp vesicles. Members having tetramerous floral organs are common in *Clausena*, but these characteristics become essential in *Hesperethusa*, *Citropsis* and certain sections of *Citrus* (Subgenus *Archicitrus*, Section *Papeda* and Section *Cephalocitrus*).

With *Citrus*, the following systematic status can be given:

(1) In both paniculate and solitary-flowered subgenera, large-winged sections are most primitive, (Section *Papeda* versus Section *Osmocitrus*) and both have broadest wild distribution.

(2) From a geographical standpoint, *C. macroptera* MONT. is oldest in existence, as it nearly reaches Australia, where no *Citrus* occurs. *C. hystrix* DC. has narrower distribution and *C. latipes* TANAKA only occurs in the Eastern Himalaya.

These three represent the Section *Papeda*, with distinct inflorescences, but the following species represent the Section *Osmocitrus* having solitary flowers. *C. junos* SIEB. ex TANAKA has broadest wild distribution among all Citrus fruits found in China: It reaches almost the Burmese frontier and runs along the Yangtse River region, where *C. ichangensis* SWINGLE apears in smaller area.

(3) The lime (Section *Limonelles*) and the shaddock (Section *Cephalocitrus*) are closely related to the *Papeda*, and all are very similar in climatological requirement.

(4) The lime, *C. aurantifolia* SWINGLE, most frequently occurs wild in Southern India Peninsula. The shaddock, *C. grandis* OSBECK, occurs wild in eastern Himalaya, Burma, and perhaps in Yunnan. Both have no characteristic companions of distinct geographic

independence, but local species are very abundant both wild and cultivated. The grape fruit from Barbados, *C. paradisi* MACF., is the most characteristic cultigen derived from the latter.

(5) The lemon and citron (Section *Citrophorum*) are rather far from the above given fundamental groups, only related to the lime in fruit characters, though leaves and flowers are entirely different.

(6) The citron, *C. medica* LINN., and the Canton lemon, *C. limonia* OSBECK, have almost identical distribution as the shaddock, and they have rather few derivations, except such well known species like the Florida rough lemon, *C. jambhiri* LUSH. of India, which is the nearest relative of the latter. The lemon, *C. Limon* BURM. F., grows wild in the Western Himalaya, and the sweet lemon, *C. limetta* RISSO, is amongst its few relatives mostly of garden origin.

(7) The sour and sweet oranges (Section *Aurantium*) are not so distinct from the shaddock in the flower and the fruit. Development of carotinoid pigmentation in this section is greater than in the preceding ones.

(8) The sour orange, *C. Aurantium* LINN., and the sweet orange, *C. sinensis* OSBECK, grow wild in the Eastern Himalaya, and the latter probably reaches down to Burma and Yunnan. The former has a great number of derivatives in gardens, especially with the presence of the shaddock in the same locality. Natural crossings between them seem to be most easy, giving rise to distinct cultigens. Local wild species are also not uncommon, as in the case of *C. miaray* WESTER and *C. taiwanica* TANAKA & SHIMADA. The Tankan of South China and Formosa, *C. tankan* HAYATA, is one of the very few derivatives of the sweet orange.

(9) The solitary-flowered *Citrus* (Subgenus *Metacitrus*) are all loose-skinned, but the big-winged Section *Osmocitrus* can be excluded from the true loose-skin oranges (Section *Acrumen*), by having very large seeds with nearly white cotyledons and by a very distinctive aroma of the rind. In *Acrumen*, we see again the great development of carotinoid pigmentation.

(10) Very imperfect knowledge of the true loose-skin oranges (Section *Acrumen*) has caused in the past a great misunderstanding about the bearing and the nomenclature of the Linnean species in *Citrus*. It should be borne in mind, that a name like *C. nobilis* LOUR., should be limited to the cultigen first described by LOUREIRO at Hué in Annam, now known under various names as king orange, Kunembo or, Pentikuang in America, Japan and China.

(11) The king orange represents the large-flowered *Acrumen* (Subsection *Euacrumen*), resembles the Section *Aurantium* by the large-winged leaves and comparatively thick rind of fruits, but its fruits are oblate and the cotyledons are not purely white. *C. unshiu* MARC. is another well defined cultigen of the same section.

(12) The small-flowered *Acrumen* (Subsection *Microacrumen*) are more distinct in having a ramose bushy habit, wingless smaller leaves and deep green cotyledons. It approaches *Fortunella* through the Subsection *Pseudofortunella*, having leaves with obscure venation, and the fruit with sweet rind.

(13) There are very abundant indigens and cultigens of the subsection *Microacrumen* which includes many important indigenous species so far almost entirely neglected. The identification and the determination of the limit of species of this subsection are extremely difficult, but it is very clear that this can be settled by measuring the boundary of species by means of studying closely resembling wild species, having no identity in detailed characters and occurring with geographical independence. For this investigation, *C. tachibana* TANAKA and *C. depressa* HAYATA, growing wild in Japanese territory, will present an ideal example. The former is the species north of Sambok (Amami Oshima) and the latter is distributed in Luchu south of Sambok. Both are distinct in the shape of the leaf, the shape and colour of the fruit, and the number of locules, and they are all different in minute characters of the pulp vesicles, carpel wall, integument of seeds, and so on. But they are so close that still greater difference can be set forth, between many wild and cultivated units of the subsection. Among very simple *Microacrumen*, resembling these two species, clear. specific distinction can be made, if the natural compass between the species of *Citrus* is concluded to be so narrow as shown by the example mentioned above. Among such small wild or semi-wild *Microacrumen*, one can enumerate Djeroek ragi of Java, *C. crenatifolia* LUSH., and Djeroek limoh of Java, *C. amblycarpa* OCHSE, or three distinct primitive cultigens of Southern China and Formosa, *C. sunki* HORT. ex TANAKA, *C. ponki* HORT. ex TANAKA, and *C. oleocarpa* HORT. ex TANAKA. Many other cultigens, widely divergent from these, of course, should be regarded as independent species, among which the Nagpur Suntara of India (Ponkan of Formosa), *C. poonensis* HORT. ex TANAKA, the Michieh or Kishumikan of China and Japan, *C. kinokuni* HORT. ex TANAKA, the

Fuchieh or Dancy tangerine of China and America, *C. tangerina* HORT. ex TANAKA, etc., have very important systematic and economical significance.

(14) The subsection *Pseudofortunella* is represented by a single well-founded species, *C. microcarpa* BUNGE, which is probably the most recent creation among *Citrus*, by having natural tetraploid variety.

(15) The genus *Fortunella* is characterized by smaller stature, smaller flowers and leaves exuding resinous substance underneath, greatly reduced number of carpels, sweet rind, and intensely green cotyledons.

(16) The common Kumquat orange belongs to the subgenus *Eufortunella,* which has two distinct wild members, *F. japonica* SWINGLE and *F. polyandra* TANAKA. Three cultigens, *F. margarita* SWINGLE, *F. crassifolia* SWINGLE, and *F. obovata* HORT. ex TANAKA, are also well defined. It is quite interesting to note that the most primitive-looking species, *F. Hindsii* SWINGLE, forming the monotypic subgenus *Protocitrus,* is the only tetraploid natural species of the Citrus fruits.

Judging from these facts, above mentioned, the systematic status of the Citrus fruits can be concluded as follows:

(1) All members of *Citrus* should be named properly, for the species formation in *Citrus* through the process of compound hybridity (Zygotaxis), occurs both under wild or cultivated condition, in equal opportunity and frequency.

(2) Although all representatives of the systematic sections of *Citrus* and *Fortunella* are found wild by the author's identification, minor species systematically unimportant also occur wild. More important members occur in cultivated condition, so that the question of wild and garden origin of species in *Citrus* does not mean much systematically to their validity as Linnean species. Naming of garden species (cultigens) is just as important as naming wild species (indigens), and in fact most of the present standard species have been named originally from gardens.

(3) From geographical and taxonomic evidence, it is logical to state that the limitation of species in *Citrus* is extremely narrow-compassed and the grouping of these species into a few broad-compassed imaginary species is not permissible, as such must stand as a section or subsection of the genus.

(4) All local Citrus fruits in the far East should be mobilized, properly classified and described, otherwise it is impossible to make the Citrus flora of these regions systematically clear. No identification of Citrus species can be made without the proper nomenclature of these numerous independent species.

(5) The hesitation of naming these distinct units of the genus prevents the increase of knowledge of Citrus fruits and checks the progress of Citrus industry, as the cultural requirements of these species, especially in the scion-stock relationship and the disease resistance, are entirely different.

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C. G. G. J. VAN STEENIS, *Maleische Vegetatieschetsen — Toelichting bij de plantengeografische kaart van Nederlandsch Oost-Indië* (Sketches of Malaysian vegetations — Comments to the phytogeographical map of Netherlands East India) — Reprinted from the „Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap", Ser. II, Vol. **52**, Jan.-March-May 1935, 112 pp. (repagination [Pages in the original: 25—67, 171—203, 363—398] with 46 photographs, 36 of which in the reprint only, and a phytogeographical map. The reprint preceded by a short preface, a (too) short index and a dedication to FRANZ JUNGHUHN „as a memory to his arrival in Java, one hundred years ago".

It is a great pleasure to me indeed to announce here, more particularly on behalf of those readers who are not familiar with the Dutch language, this excellent work on the phytogeography of Malaysia, published in the Journal of the Royal Netherlands Geographical Society and therefore, moreover, likely less accessible to many botanists abroad. The author has, though only about 6 years engaged in botanical work in the tropics, gathered a remarkably thorough knowledge of the rich flora of this region, no doubt one of the most interesting ones, from a biogeographic standpoint, on earth. As the phytogeography of these parts has mostly, since JUNGHUHN's „Java" (1854), been only dealt with in scattered papers, VAN STEENIS has in the publication under reference, as well as in some others that preceded it [1]), done a pioneer work in his attempt to give a comprehensive and more or less complete survey of the current problems. Our gratitude and admiration is not in the least diminished by the fact that this work shows certain traces of cursoriness and disequilibriousness, as well as a certain want of continuity and well-ponderedness. These features are mostly inherent to all pioneer work and the author himself states in the preface, that this work is meant as a provisional publication; this is in accordance with the title, which, by the way, could have been more adequately chosen, e. g.: Materials to Malaysian Phytogeography („Maleische" is, in my opinion, in Dutch a less felicitous word). Indeed, this paper contains a great many informations and stimulating ideas, and moreover, an almost complete bibliography, also of many papers in Dutch. It may be supposed indeed that there is, at present, hardly any other botanist available who is more capable than VAN STEENIS to continue this work and to prepare, some time, a complete „Phytogeography of Malaysia", to which we are looking forward with great interest.

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[1]) More or less preliminary studies by the same author are to be found in:

Bull. Jard. bot. Buitenz., Sér. III, **12**, 1932, 151—211 (Anambas and Natoena Islands).

Ibid. **13**, 1933, 1—56 (S. Sumatra).

Ibid. **13**, 1934—'35, 135—262 and 289—417 (On the Origin of the Malaysian Mountain Flora; equally a publication of great importance and with numerous references).

We dispose now of a great number of data, though still more or less in the form of scattered annotations. Yet, VAN STEENIS has endeavoured to go farther and to give a frame work; how far he has succeeded therein, will be discussed below.

To begin with, these „sketches" are meant to elucidate the first detailed vegetation map of Malaysia ever made. This map is a reprint of sheet 7 (the first one to be issued) of the „Scientific Atlas of the Tropical Netherlands" in 31 sheets, prepared by the Royal Netherlands Geographical Society. This sheet, 37½ by 59 cm in size, contains a physiognomic vegetation map of Netherlands India 1: 10 000 000 and, besides 9 faunistic and 4 meteorologic cartoons, 3 cartoons with plant area's and 1 (of Java only), indicating the correlations of some plant area's (and also of tea plantations) and drought distribution in the year (severity of the dry season).

The text is divided into two parts, a general one and a special part. The general part contains 9 paragraphs, each with a bibliography (par. 6 even with 96 numbers). Their contents are not always very well coordinated and it is especially this part which, in spite of its remarkable fullness of data, leaves us somewhat unsatisfied by its want of surveyability. The paragraphs are respectively dealing with: 1. an introductory; 2. the origin of the map; 3. remarks on earlier vegetation maps of the region in question; however, only world maps are quoted, on which Malaysia forms only a small part, but — it must be admitted — having almost always been dealt with most unaccurately; 4. the fundaments and sources to the map, taken from literature as well as from oral and written information from many sides, and particularly from information largely procured by the intensive cooperation of the Forestry Service. In this paragraph an introduction is given to 5. in which 175 vegetation-types have been enumerated, that have been dealt with more in detail in the special part (called „regional descriptions" by the author). As I have to put forward some objections to the arrangement of these vegetation-types at some length, I will postpone their discussion now; 6. general (better: miscellaneous) remarks on various subjects, such as local flora's and vegetations, many interesting informations on and a map of the forests in Netherlands India (forest-storeys, composition, elements), the influence of man (forest products, culling, cultivations, fires [also by lightning]), reforestation, altitudinal zones; 7. remarks to the map; 8. soil and flora, containing some data on the correlation of edaphic factors in general and plant distribution (lime, halophytes, soda, silica, clay, loam, etc.); 9. correlation of climate and flora in Java, text to elucidate the cartoon, mentioned above. The paper on this subject by the referent (Blumea I, 1934, 120—123), not mentioned by VAN STEENIS, has apparently been received too late to be dealt with. This paragraph contains a discussion on the distribution of some cultivated plants (sugar cane, tea) as well as some wild plants (*Andropogon contortus; Nepenthes gymnamphora*, with map).

The special part is numbered par. 10 and contains more or less detailed descriptions, with eventual references, of the vegetation-types, enumerated in par. 5. I have now to discuss their arrangement and subdivision, which we may suppose to be meant as a tentative scheme or frame-work to serve as a basis for future work. The first subdivision is based upon whether the vegetation is natural or artificial:

1—101 „natural'' vegetations (cultivated forests of teak, sagu etc. incl.).

- 2—15 grass, fern and shrub jungles
- 20 second growth forests
- 30—101 primaeval forest

150—175 artificial vegetations (cultivations).

The author means to leave open the possibility to intercalate thusfar unmentioned vegetations, having only enumerated a limited number in the scheme given. His subdivision runs therefore e. g.

1. „jungles" in general
    2. jungles of shrubs, grasses or ferns
        3. litoral zone
        4. beach zone
        5. dunes (also inland dunes)
        6. freshwater vegetations
        etc. as far as
        15. savannah-like vegetations
    20. second growth forests (no subdivision)
    30. other, mostly older forests
        31. palm forests
            32. Nipa
            33. sagu
            etc. to
            39. Borassus
            39*a*. Corypha
            39*b*. Livistona
            39*c*. Pinanga
    40. Casuarina
    41. Coniferous forests
        (subdivision 42—47).
    48. Bamboo forests
    49. Pandanus
    50. Fern trees
    55. Leafwood forests
        56. Forests of deciduous trees
            57. Heterogeneous
            58. Teak forests
        60. „Evergreen" forests
            61. Heterogeneous
            62. Tidal forests
                (subdivision 63—66)
            70. Dipterocarpaceous forests
                (subdivision 71—77)
            80—101. Several dominating trees
                (genera or species)
150. Cultivated grounds
    etc.

I have mentioned this statement at some length, because in my opinion it fails in the present state of plant physiognomy and sociology, to satisfy legitimate demands of logic and surveyability. In the above statement 1 stands opposite to 150. The latter number has apparently been chosen, since the next lower one was 101; had this been, say 95, then the second category would have probably started with 100. Now 2 is equivalent (or printed in such a way that it seems equivalent) with 20, 30, 40, 41 etc., however, 3—15 with 31, 56 and 60, 32—39*c* and 42—47 with 57, 58, 61, 62, 70.

80—101, and 63—66 finally with 71—77. I think, there is a lack of uniformity and adequate subordination in this system, which might have been avoided, if the decimal system had been used, which is sometimes used in bibliography. This system allows a more logical and equilibrated subdivision and can always be applied in such a way that intercalations are feasible without additions of *a*, *b*, *c* etc. (cf. 39). Of course, it is not necessary to go so far as to use such a decimal system in connection with that, proposed for libraries in which [1]:

5 = Science
58 Botany
58.1 Phytobiology (sic!)
58.19 Phytogeography

and e. g.

9 = History and Geography
91 Geography
922 Java
922.1 West Java
etc.

On the contrary, I think it is practically impossible to use more of this apparently not very successfull scheme than the primary idea and the arrangement of the groups could then be based upon such factors as altitude, climate, soil, etc., etc. If we take VAN STEENIS's own paper on the mountain flora, quoted above (p. 327), as a basis, the number of zones indicated there being only 7, we need not commence with 0, thus using the numbers 1—7, e. g. in the following (or any other) way:

1. Marine Zone (alt. —5 to —0.25 m)
   11. alt. —5 to —1 m (*litoral zone*)
      111. Algae
         1111, 1112, etc. (various types)
      112. Phanerogams
         1121, 1122, etc. (various types)
      (111–112: or a sociological subdivision)
      113.
      etc.
   12. alt. —1 to —0.25 m (*mangrove*)
      121. Rhizophora
      122. Bruguiera
      123. Avicennia
      (121–123: or a sociological zonation)
      etc.
2. Tropical zone (alt. 0.25—1000 m)
   21. alt. 0.25—1 m (*beach weed flora*)
      211, 212, etc. (various types)
   22. alt. 1—5 m (*beach forest and dunes*)
      211. beach forest
         2111, 2112, etc. (various types)
      212. dunes
         2121, 2122, etc. (various types)

[1]) cf. H. J. VAN LUMMEL en L. VAN VUUREN, Meded. Encyclop. Bur. N. I. 13, 1917, 169—314 and I—XVI (Literatuurstudie van Halmaheira).

23. alt. 5—500 m (*lowland zone*)
(many subdivisions possible)
24. alt. 500—1000 m (*colline zone*)
(many subdivisions possible)
3. Submontane zone (alt. 1000—1500 m)
etc. to
7. Nival zone (alt. 4600—5000 m)

It is not my intention to criticize here the above zonation; I would only suggest the author to consider the practical possibilities of this scheme, which is, I think, elastic and simple. I would add the suggestion that, as far as possible, sociological or ecological subdivisions should be given preference above floristic ones and that the final scheme be established in such a way that minor alterations may be made for many years to come without affecting the general principle and the main subdivision chosen.

I have little to add concerning the regional description of the second part. An astonishing great number of interesting and very different items has been gathered here. To some of the paragraphs some additional or correcting remarks could be made (and the author recommends himself to be presented with such informations), but here that would be throwing water into the Thames. Some paragraphs are more elaborate, others refer only to one dominating species or to literature, but together they form a wealth of information, on which both the author and the reader may be congratulated. The photographs are, with few exceptions, good and representative; eight of them are splendid large-size brown reproductions with a very minute lath.

The map and the cartoon are carefully prepared, drawn and printed. It is striking to observe how little forest is left in a part of N.E. Sumatra and W. Borneo, and especially in Java, Bali and Lombok. Large area's are covered with secondary forest in Sumatra, with teak in Central Java. Dominating species in primaeval forests (*Dipterocarpaceae*, *Agathis*, sagu, *Pinus*, *Melaleuca*) are indicated by various kinds of hatching. As to New Guinea, the map does not agree in some details with that, prepared by the referent some time ago (Blumea I, 116—117 and in „Nieuw-Guinee" I, 1935, 200—201), but it must be admitted that our knowledge of that immense island is still too scanty to attach much weight to such differences. It is, I think, to be regretted that the same (yellow) colour has been chosen for all open vegetations („shrub, grass and fern jungles"), whether in the lowland (except the savannah's, which are dotted) or in the subalpine zone.

As a matter of course, the area cartoons could only give an extremely scanty selection from the data available. Almost every individual writer would have made a different choice, and also that of VAN STEENIS has a personal character, but it gives several representative and remarkable examples.

H. J. LAM.

W. M. DOCTERS VAN LEEUWEN, *Krakatau 1883—1933, A. Botany* — Ann. du Jard. bot. de Buitenzorg 46 and 47, May 1st 1936 — XII + 506, with a frontispiece, 10 text figures, 60 photographs and a map.

Fifty years after the event that was almost as important and searching to

biologists as it was to volcanologists, we are glad to dispose of two authoritative and exhaustive publications on what happened with the flora of Krakatau, one by A. ERNST (Vierteljahrsch. Naturforsch. Ges. Zürich, Dec. 31st, 1934) and the other by W. M. DOCTERS VAN LEEUWEN. ENRST, the European University professor, transient visitor twice, unconcerned and mastering modern botany in its full extent; DOCTERS VAN LEEUWEN, with a long tropical career, experienced field botanist (and zoologist), retired director of the Botanic Gardens at Buitenzorg and investigator for many years and many a long day. These two men well complement each other and it may be accepted that, being published with an interval of little more than a year, their publications seclude a period of investigation, publication and contention. For many decades to come little is left to be said on the problem as it was; there only remains to tell how things will gradually change and develop. Every side of ''The Problem of Krakatoa, as seen by a botanist'' has been thrown light upon, more impartial and less one-sided than has been done by the third man who gave an extensive contribution, with the title just quoted, C. A. BACKER. If the contest has ended now, as may be hoped, both ERNST and DOCTERS VAN LEEUWEN have dignifiedly contributed to bring back the problem to its essential proportions. I reviewed ERNST's paper (Vakblad voor Biologen **16**, 1935, 161—166) and I will therefore refrain from discussing in detail the work of DOCTERS VAN LEEUWEN, in order that I need not deal with the same questions twice. Yet, nobody who is interested in the problem, can venture to do without either of the two publications referred to. The fulness of personal impressions gives DOCTERS VAN LEEUWEN's work an attractiveness and a value that cannot be surpassed by anybody else. It deals with a subject, treated at length shortly before, but it is of a very personal nature, containing all known particulars of the volcano before and after the famous eruption, comparative studies on similar events, a complete history of the research, to which the frequent experiences of the author yield a very vivid character, interesting chapters on dispersal, on sociology and successions, and on the new-born „Anak Krakatau", and finally a complete and reasoned enumeration of all Zoocecidia, Bryophytes (33 + 38), Pteridophytes (61) and Spermatophytes (263), some time collected or observed on one of the isles.

An extensive bibliography (12 pp.) and an index (18 pp.) precede a series of splendid photographs. The publication ends with a map in black without many particulars, perhaps the only disappointment in this important and well-edited work. I would have preferred to have inserted, in addition to a small-size general map, coloured vegetations maps of the separate islands with the indication of the altitudinal zones in various phases of development.

H. J. LAM.

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Podostemonaceae in New-Guinea?

The Podostemonaceae are a plant family that has apparently originated in tropical America, as is well pointed out by F. A. F. C. WENT (1). Its generic and specific density diminishes towards the East and at the same time its differentiation (specialization, reduction) increases. Thus far, the eastern boundary of its area is found in S. Japan (Kyu-Syu), Indo-China, an island off the Siamese coast, a

doubtful habitat in the Philippines, and finally S. Celebes and E. Java (*Cladopus Nymani* MÖLL.).

Now some time ago my attention was drawn by a passage in D'ALBERTIS's well-known narrative: „New Guinea: What I did and what I saw" (Vol. II, 1880, 93), on his exploration of the Fly River in S. New Guinea, running:

„Today (June 17, 1876) I met, for the first time, with a plant which I must „call extraordinary. It grows on the heaps of stones that abound in the river, and „seen from a certain distance, its dark colour, almost black, and its peculiar shape, „makes it resemble the scales of a serpent. Its branches lie flat, so as to offer as „little resistance as possible to the water. It owes to this curious conformation its „power of resisting the strength of the current".

I wonder whether something else can be meant here than podostemonaceous plants. The author being a zoologist, his plant and vegetation descriptions are not always very elaborate and hard to interpret. But, if we remember, how long *Cladopus* has remained unknown in a relatively well-investigated country as Java (MÖLLER and NYMAN discovered it only in 1897 and it has even been detected near Buitenzorg in — I understand — 1929), and if we further bear in mind that still more eastern species may eventually be still more reduced in size, it seems not at all impossible that New Guinea rivers contain a representative of this remarkable plant family, the distribution of which is very important for historical phytogeographical problems, since it merely contains highly adapted freshwater plants. Let me make two quotations from WENT's paper (1):

„Even granting that the possibility exists of the discovery of one of these small species on New Guinea or on one of the islands of the Pacific, I rather think that this is not very probable" (p. 1906) and

„the flora of many islands in the Pacific is known only incompletely, so, it is possible, if indeed not probable, that Podostemonaceae may be detected there, especially because these small forms are easily overlooked, or taken for liverworts. Accordingly, I would urge those botanists, who study the flora of the Pacific Islands to keep a sharp lookout for Podostemonaceae, because their occurrence would compel us to alter our ideas as to the age of the Pacific Ocean." (p. 1911).

May I, in addition, and particularly in view of D'ALBERTIS's observation mentioned, suggest that Australian or other explorers look out for these plants, as the opportunity occurs? I would also be obliged to learn additional informations, eventually known to other people.

The above had been set up in type, when a small paper by VAN STEENIS on "The Podostemaceae of the Netherlands Indies" (Bull. du Jard. bot. de Buitenzorg, Sér. III, Vol. XIII, 530—534, July 1936) was received by me. The area of the order, mentioned there, agrees pretty well with that given above but for the remarkable habitat of *Torrenticola* DOMIN, an unsufficiently known genus from Queensland [1]). DOMIN's description is not available to me, but A. LEMÉE writes (Dict. descr. et syn. VI, 1935, 625): "T. queenslandia (*sic*) Domin, d'Australie, forme sur les rochers de petits „thalles étroits entiers à aspect de Fucus qui sont abondamment couverts de courtes

[1]) ENGLER-DIELS, Syllabus der Pflanzenfamilien, 11th Ed. 1936, 185, mentions Australia also.

„pousses flottantes densément feuillées''. Could it be possible that D'ALBERTIS observed a representative of this genus in the Fly River region?

H. J. LAM.

References.

1. F. A. F. C. WENT — Proc. Third Pan-Pacific Science Congress 1926, II (1928), 1906—1911.
2. —— Jaarversl. Prov. Utr. Gen. v. K. & W. 1929 (1930).
3. —— De Trop. Nat. **19**, 1930, 53—60, 5 figs.

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THE UMBELLIFERAE OF THE NETHERLANDS INDIES

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Besides the *Umbelliferae* of the Netherlands Indies proper, also those of the Malay Peninsula and the non-Dutch parts of Borneo and New Guinea have been taken up in this revision. The materials examined belong to the following Herbaria:

(B) = the Herbarium of the Botanic Garden, Buitenzorg.
(BD) = the Herbarium of the Botanical Museum, Berlin—Dahlem.
(BM) = the Herbarium of the British Museum of Natural History, London.
(E) = the Herbarium of the Botanic Garden, Edinburgh.
(G) = the Herbarium of the University, Groningen.
(K) = the Herbarium of the Botanic Gardens, Kew.
(L) = the National Herbarium (Rijksherbarium), Leiden.
(NY) = the Herbarium of the Botanic Garden, New York.
(Pa) = the Herbarium of the Java Sugar Experiment Station, Pasoeroean.
(S) = the Herbarium of the Botanic Gardens, Singapore.
(Sa) = the Herbarium of the Sarawak Museum, Kuching.
(U) = the Herbarium of the University, Utrecht.

Most of the herbarium materials were sent to Groningen to be examined there. Moreover I had the opportunity to work a few weeks in the Kew Herbarium and in that of the British Museum of Natural History in London.

I render my best thanks to the Directors and Keepers of all these Herbaria for their kind assistance.

Umbelliferae.

For the delimitation and arrangement of the genera this paper follows, without criticism, DRUDE's system as given in Die Natürlichen Pflanzenfamilien, III, 8. Therefore it appeared useless to recount the characters of the genera. For those who prefer to determine the genera in the most correct way, *viz.* with help of the anatomy of the fruit, I must refer to DRUDE's excellent key *l. c.* p. 114—115. As none of the

genera has its centre of development in the Malay Archipelago, the lists of synonyms and literature are restricted to the most necessary data.

As a result of this revision, 43 species, belonging to 22 genera, appear to occur in the area considered. Of these species, 16 are cultivated, *viz.* those of *Chaerefolium, Coriandrum, Cuminum, Apium, Petroselinum, Trachyspermum, Cryptotaenia, Carum, Foeniculum, Anethum, Pastinaca,* and *Daucus,* moreover *Trachymene caerulea* and *Pimpinella Anisum.* Of all these species only *Foeniculum vulgare* and *Daucus Carota* appear to be naturalised in few localities in Java. *Eryngium foetidum* is a weed introduced from America, but is entirely naturalized now. The case of *Torilis japonica* is doubtful. Perhaps it has been introduced from temperate regions, perhaps its area of distribution is entirely natural and reaches from temperate Asia, over a part of tropical Asia, as far as Java. The remaining genera are really indigenous, *viz. Hydrocotyle,* with 3 species; *Centella,* with 1 species; *Trachymene,* with 13 species; *Sanicula,* with 1 species; *Oreomyrrhis,* with 3 species; *Pimpinella,* with 2 species; *Oenanthe,* with 1 species; *Heracleum,* with 1 species, together 25 species. They may, after their total area of distribution, be divided into three groups. The first group is that of *Hydrocotyle* and *Centella,* widely spread north and south of the Malay Archipelago and occurring at low as well as at high elevations. The second group is that of the genera of Asiatic origin. They are chiefly mountain plants of the western parts of the Malay Archipelago, *viz. Sanicula,* spread in eastern direction as far as Timor and Séran; *Pimpinella,* only found in Java and Bali; *Heracleum,* found in Sumatra on one mountain only; moreover *Oenanthe,* spread throughout the area, and even occurring in Queensland. The third group is that of *Oreomyrrhis* and *Trachymene,* having their centre of development in Australia, but protruding far northward, *Oreomyrrhis* as far as Mt. Kinabalu in Borneo, *Trachymene* as far as the island of Mindoro in the Philippines. They are mountain plants, chiefly of the eastern parts of the Malay Archipelago.

Key to the genera.

1 Flowers in simple umbels or heads that often are united in more compound inflorescences, but not in compound umbels 2
Flowers in compound umbels that sometimes are united in more compound inflorescences 7
2 Leaves and involucres prickly. Flowers in heads. . . . . . **5. Eryngium**
Leaves and involucres not prickly. Flowers in umbels 3

3 Fruit with uncinate bristles . . . . **4. Sanicula**
Fruit not with uncinate bristles 4
4 Fruit laterally flattened, not longer than broad 5
Fruit not laterally flattened, more than twice as long as broad **9. Oreomyrrhis**
5 Mericarps 3-ribbed 6
Mericarps 7—9-ribbed, with connecting veins between the ribs **2. Centella**
6 Leaves without sheaths, but with distinct, entire stipules. Corolla valvate **1. Hydrocotyle**
Leaves with sheaths, with or without lacerate stipule-like appendages. Corolla imbricate . . . . **3. Trachymene**
7 Mericarps winged at the margins 8
Mericarps not winged at the margins 10
8 Fruit strongly dorsally flattened, not longer than broad. Leaves pennate to bipennate, the extreme segments oblong-ovate 9
Fruit not strongly dorsally flattened, more than twice as long as broad. Leaves tripennate, the extreme segments nearly filiformous . . **19. Anethum** *)
9 Ovary hairy. Corolla white or reddish, radiating . . . . **21. Heracleum**
Ovary glabrous. Corolla yellow, not radiating . . . . . . **20. Pastinaca**
10 Fruit laterally flattened. Leaves not compound, roundish in outline . . . **1. Hydrocotyle**
Fruit not laterally flattened. Leaves usually compound 11
11 Fruit with a sterile neck or short beak, that is visible on the ovary as a dark-green ribbed neck . . . . **6. Chaerefolium**
Fruit without sterile neck or beak 12
12 Calyx teeth distinct 13
Calyx teeth not distinct 16
13 Ovary and fruit bristly 14
Ovary and fruit entirely glabrous 15
14 Fruit with uncinate bristles. Stems and leaves hairy. Leaf segments not very narrow. Flowers not radiating . . . . **7. Torilis**
Fruit with stellate hairs. Stems and leaves glabrous. Extreme leaf segments linear to filiformous. Flowers radiating . . . . **10. Cuminum**
15 Mericarps hollow at the inside. Primary ribs visible as undulate lines, secondary ribs somewhat more prominent. Flowers radiating . . **8. Coriandrum**
Mericarps not hollow at the inside. Marginal ribs thicker than the lateral ones, secondary ribs none. Flowers not radiating . . . . **17. Oenanthe**
16 Ovary and fruit entirely glabrous 17
Ovary and fruit bristly, hairy, or with scale-like trichomes 21
17 Leaves ternate. Umbels and umbellules few-rayed . . **14. Cryptotaenia**
Leaves pennate or bipennate 18
18 Flowers yellow or yellowish-green 19
Flowers white or reddish 20
19 Involucels many-leaved. Leaves 3—4-pennate with nearly filiformous extreme segments . . . . **18. Foeniculum**
Involucels 0—2-leaved. Lower leaves tripennate with leaflets obovate or cuneate . . . . **12. Petroselinum**

20 Ripe fruit 1.5—2 mm long and broad, roundish when seen from aside. Carpophore entire or very shortly bifid at the apex . . . **11. Apium**
Ripe fruit 4—5 mm long and half as broad. Carpophore bifid to nearly two-thirds of its length. . . . . **15. Carum**
21 Involucral leaves pennatifid . . . . **22. Daucus**
Involucral leaves not pennatifid 22
22 Leaves simple, or pennate with simple leaflets. Leaves and stems hairy . **16. Pimpinella**
Leaves pennate with divided leaflets. Leaves and stems glabrous . . . . **13. Trachyspermum**

*) *Foeniculum* and *Anethum* are very alike with exception of their fruit, which in *Anethum* are very distinctly winged, in *Foeniculum* not at all. When ripe fruit are not extant, *Foeniculum vulgare* and *Anethum graveolens* may be distinguished, besides by their characteristic odour, by slight differences of the stems and leaves: in *Foeniculum* the stems are finely puncticulate, the sheaths are longer and broader than in *Anethum*, the main leaflets are usually shortly petioluled. In *Anethum* the stems are not puncticulate, the sheaths are usually short in the lower leaves, the main leaflets are usually long-petioluled.

I. HYDROCOTYLE

LINN., Sp. pl., ed. 1, 1 (1753) p. 234; Gen. pl., ed. 5 (1754) p. 109; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 116, 117 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 951 (1925); *Hydrocotyle* sect. *Euhydrocotyle* BENTH., Fl. austr., 3, p. 337 (1866); BENTH. & HOOK.F., Gen. pl., 1, p. 872 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 667 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2, p. 613 (1890).

Key to the species.

1 Leaves peltate . . . . **3. H. vulgaris**
Leaves not peltate 2
2 Leaves usually less than 3 cm in diameter. Stems creeping, sometimes with ascending extremities. Inflorescences single, sessile or short-peduncled along the creeping stems and the ascending tips. Fruit up to 15 in each inflorescence, yellow to dark-brown when ripe . . . **2. H. sibthorpioides**
Leaves usually more than 3 cm in diameter. Stems creeping, with ascending branches. Inflorescences single or in bundles, sessile to long-peduncled, along the ascending branches only. Fruit more than 15 in each inflorescence, blackish-brown when ripe . . . . **1. H. javanica**

1. Hydrocotyle javanica THUNBERG — Herbaceous; stems creeping, with ascending flower-bearing branches, rarely entirely erect, 10—50 cm high, terete, glabrous or short-hairy. Leaves petiolate and stipulate; stipules 3—8 mm long, 4—6 mm broad, broadly ovate, rounded to acute, membranaceous, entire or sometimes fringed at the apex; petiole 2—20 cm long, shorter towards the extremities of the stems, short-hairy

with divaricate or more or less reflexed hairs; lamina 3—8 cm long and broad, smaller from the base to the tip of the stem, roundish to 5—8-angular in outline, cordate, 5—8-lobate, with more or less triangular lobes that are crenate to crenate-serrate, usually glabrous, rarely sparsely hairy on both sides. Inflorescences single or in groups opposite to the leaves, sometimes united to an umbel with an involucre of few small bracts, sometimes also terminal, but only originating from the ascending branches of the main stem; peduncle 1—7 cm long, rarely none, terete, glabrous or short-hairy; involucre with many bracts around and between the flowers that are nearly 1 mm long 0.75 mm broad, ovate, acute, sometimes with 2 small teeth at the base, often quite entire, the outer ones reflexed when fruit-bearing. Flowers sessile or upon pedicels up to 5 mm long, 15—50 in each inflorescence; calyx teeth none; petals nearly 1 mm long 0.5 mm broad, lanceolate, acute, valvate, styles nearly 0.5 mm long; mericarps 1—1.25 mm long, nearly 0.75 mm broad, red-brown to blackish when ripe, glabrous or short-hirsute, or even with short curved hairs, sometimes red-punctate when young, their lateral ribs not prominent.

Hydrocotyle javanica THUNBERG, Diss. Hydrocot. (1798) p. 3, no. 17, p. 6, t. 2; RICHARD, in Ann. Gén. Sc. Phys., 4, p. 65 (1820); D. C., Prodr., 4 (1830) p. 67; MORITZI, Syst. Verz. (1845—46) p. 41; MIQUEL, Fl. Ind. Bat., I, 1, p. 734 (1856); THWAITES, Enum. pl. Zeyl. (1859) p. 130; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 37; HIERN, in Fl. Trop. Afr., 3, p. 4 (1871); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 667 (1879) cum var. *podantha*; VIDAL, Phanerog. Cuming. Philipp. (1885) p. 19, 116; Rev. Pl. Vasc. Filip. (1886) p. 144; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 613; STAPF, in Transact. Linn. Soc., ser. 2, bot., 4 (1894) p. 120, 167; TRIMEN, Handb. Fl. Ceyl., 2 (1894) p. 275; DRUDE, in Engl. & Pr., Nat. Pflanzenfam., III, 8, p. 119 (1898); KING, Mater. Fl. Mal. Pen., 13 (1902) p. 598; MATSUMURA & HAYATA, Enum. pl. Formos., p. 170 (1906); HAYATA, Fl. mont. Formos., p. 101 (1908); ELMER, Leafl. Phil. Bot., 2, p. 629 (1909); HAYATA, Ic. Pl. Formos., 2, p. 50 (1912); GIBBS, in Journ. Linn. Soc., bot., 42, p. 24, 85 (1914); RIDLEY, in Transact. Linn. Soc., ser. 2, bot., IX, 1, p. 62 (1916); BOLDINGH, Zakfl. Landbouwstr. Java (1916) p. 174; HEYNE, Nutt. pl. Ned. Ind., ed. 1, 3 (1917) p. 394; RIDLEY, in Journ. F. M. S. Mus., VIII, 4 (1917) p. 42; GIBBS, Contr. Arfak Mts. (1917) p. 165; MERRILL, Bibl. enum. Born. pl. (1921) p. 458; RIDLEY, Fl. Mal. Pen., 1 (1922) p. 869, ic. 73; MERRILL, En. Phil. Fl. Pl., 3 (1923) p. 237; RIDLEY, in Journ. Mal. Br. Roy. As. Soc., 1, p. 63 (1923); HEYNE, Nutt. pl. Ned.

Ind., ed. 2 (1927) 2, p. 1210; VAN STEENIS, in Trop. Nat., 17 (1928) p. 200; DAKKUS, in Bull. Jard. Bot. Buitenzorg, sér. 3, suppl. 1 (1930) p. 164; CRAIB, Fl. siam. enum., 1, p. 786 (1931); FREY-WYSSLING, in Trop. Nat., 22 (1933) p. 5; BURKILL, Dict. Econ. Prod. Mal. Penins., 1 (1935) p. 1212; *Hydrocotyle hirta* R. BROWN, ex RICHARD, in Ann. Gén. Sc. Phys., 4, p. 64 (1820); BENTHAM, Fl. austr., 3 (1866) p. 339; FILET, Plantk. Woordenb. (1876) p. 255; BAILEY, Queensl. Fl., 2 (1900) p. 715; WOLFF, in SCHUM. & LAUTERB., Nachtr. Fl. deutsch. Schutzgeb. (1905) p. 333; BAILEY, Compr. Cat. Queensl. Pl. (1913) p. 228; EWART, Fl. Victoria (1930) p. 895; LAUTERBACH, in Bot. Jahrb., 63, p. 473 (1930); *Hydrocotyle nepalensis* HOOK., Exotic Fl., 1, t. 30 (1823); D. C., Prodr., 4 (1830) p. 65; MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 91 (1851); MIQUEL, Fl. Ind. Bat., I, 1, p. 735 (1856); Ill. Fl. Arch. Ind. (1871) p. 38 cum forma *zeylanica*; FILET, Plantk. Woordenb. (1876) p. 109; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 613; KOORDERS-SCHUMACHER, Syst. Verz., I, 1, fam. 228, p. 97 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 722; *Hydrocotyle sundaica* BLUME, Bijdr., 15 (1826) p. 883; D. C., Prodr., 4 (1830) p. 67; HASSKARL, Cat. pl. Hort. Bot. Bogor. (1844) p. 163; MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 93 (1851); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 138; MIQUEL, Fl. Ind. Bat., I, 1, p. 734 (1856); TEYSM. & BINNEND., Cat. pl. Hort. Bot. Bogor. (1866) p. 165; FILET, Plantk. Woordenb. (1876) p. 77; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. 3, suppl. 1 (1930) p. 164; *Hydrocotyle globata* BLUME, Bijdr., 15 (1826) p. 883; D. C., Prodr., 4 (1830) p. 67; ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 138; MIQUEL, Fl. Ind. Bat., I, 1, p. 735 (1856); *Hydrocotyle zeylanica* D. C., Prodr., 4 (1830) p. 67; WIGHT & ARN., Prodr. Fl. Pen. Ind. Or. (1834) p. 366; MIQUEL, Fl. Ind. Bat., I, 1, p. 734 (1856); suppl. Sum. (1860) p. 134; *Hydrocotyle podantha* MOLKENB., in MIQUEL, Pl. Junghuhn., p. 89 (1851); MIQUEL, Fl. Ind. Bat., I, 1, p. 732 (1856); JUNGHUHN, Java, ed. HASSKARL, 1, p. 432 (1857); MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 37; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 613; DE CLERCQ, Plantk. Woordenb. (1909) p. 258; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 721; *Hydrocotyle rotundifolia* (non D. C., 1830) WARBURG, in Bot. Jahrb., 13, p. 397 (1891); SCHUMANN & LAUTERB., Fl. deutsch. Schutzgeb. (1901) p. 487; KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; *Hydrocotyle novo-guinensis* WARBURG, in Bot. Jahrb., 16, p. 24 (1892); SCHUMANN & LAUTERB., Fl. deutsch. Schutzgeb. (1901) p. 487; *Hydrocotyle Versteegii* HEMSLEY, in Kew Bull. (1909) p. 259.

Hydrocotyle javanica is spread over the whole area dealt with in

this paper, and is found from 30 to 3800 m elevation. It is, as a rule, well-distinguished from *H. sibthorpioides,* though for small forms of *H. javanica* it is often difficult to indicate exactly the differences with *H. sibthorpioides.* Those small forms, however, are nearly restricted to the higher parts of mountains, where large forms of *H. sibthorpioides* hardly occur, and if they do, are easily distinguished by their more roundish leaves and the arrangement of the inflorescences.

WARBURG distinguishes *H. novo-guinensis,* from New Guinea, based on the occurrence of curved hairs of the fruit, but agreeing, for the rest, with *H. javanica.* Of most materials from New Guinea, however, the fruit show such hairs, and now and then haired and glabrous fruit occur together on the same plant. Moreover, in the closely allied *H. sibthorpioides* specimens with hairy fruit occur as well as such with glabrous fruit, whereas it is impossible to trace a sharp limit between these two varieties.

H. Versteegii is mainly based on its peculiar leaf-shape. The same leaf-shape, however, we meet with in plants from Sumatra and Java, especially in forms of high mountains, and there we find all intermediary stages between such forms and the common ones.

The other species names listed here as synonyms, represent forms since long rightly united with *H. nepalensis* by former authors. Among them, *H. podantha,* or the var. *podantha,* with long-pedicelled flowers, is very striking in its extremes, but is connected with the more common form, with sessile or nearly sessile flowers, by a complete series of intermediates. The other varieties mentioned are less important.

MALAY PENINSULA. Kelantan, Kuala Sameh, NUR & FOXWORTHY s.n. (S); Kuala Pertang, NUR & FOXWORTHY 10283 (S); Gua Ninik, HENDERSON 19548 (B, S), v.n.: *pegaga gajah*; Perak, SCORTECHINI 1186 (BD); Temango, RIDLEY 14618 (S); Maxwell's Hill, 1100 m el., BURKILL & HANIFF 12912 (S); Gunong Pondok, north side, BURKILL 13902 (S); near the cottage, 1500—1800 m el., CURTIS 2086 (S), RIDLEY s.n. (S); Gunong Kerbau, Sungei Siput, HANIFF 4005, 4026 (S); upper Batang Padang valley, 600 m el., WRAY 1458 (S); Tapoh, CURTIS s.n. (S), v.n.: *pegaga gajah*; Goping district, 90—120 m el., KING's coll. 8197 (B); Pahang, Telom, RIDLEY 13541 (S); Lubok Tamang, 1050 m el., HENDERSON 11029 (S); Cameron's Highlands, Tanah Rata clearing, 1440 m el., HENDERSON 17931 (B, S); Fraser Hill, Tras valley, 1080 m el., HOLTTUM s.n. (S); south ridge, 1140 m el., NUR 11413 (S); base Gunong Senyum, low el., HENDERSON 22217 (S); Kuala Tahan, 105 m el., SEIMUND 37 (S); Selangor, Ulu Gombak, HUME 8813 (S).

SUMATRA. Atjèh, above Takingeun, 1260 m el., VAN STEENIS 5974 (B); Lant Toepandji, 1900 m el., VAN STEENIS 6541 (B); Gajo Loeëus, Kota Lawe Sagoe, PRINGGO ATMODJO (exp. VAN DAALEN) 396 (B, L); Kota Lintang, PRINGGO ATMODJO (exp. VAN DAALEN) 215 (B, L); Tandjoeng Morawa, 30 m el., LÖRZING 4033 (B); Badjalinggi, s. of Tebingtinggi, 100 m el., LÖRZING 7463 (B); Sibolangit, 400 m el.,

DOCTERS VAN LEEUWEN 12714 (B); 450 m el., KARTA 15 (B, S); Botanic Garden, 400—500 m el., LÖRZING 3867 (B); Boekit Keloeang, NUR 7423 (B, S); Berastagi, BURKILL 73 (S); G. Sinaboeng, n. slope, 1450 m el., LÖRZING 8226 (B); Karo Plateau, n. of Berastagi, 1425 m el., LÖRZING 6786 (B, L); Siberaja, Laoe Biang valley, 1150 m el., LÖRZING 9526 (B, L); Toba, Oeloean, 900 m el., OUWEHAND 142 (B); Batak regions, prob. southern part, JUNGHUHN s.n. (L), originals of *Hydrocotyle nepalensis*, forma *zeylanica* MIQUEL; Sumatra's Westkust, KORTHALS s.n. (L); Balang Paloepoeh, 900 m el., KLEINHOONTE 648 (B); Padang, Airmantjoer, 360 m el., BECCARI P.S. 623 (L); Bt. Nantigi, nr. G. Malintang, 1150 m el., BÜNNEMEIJER 3778 (B, BD, L, S, U), v.n.: *pigagoh*; G. Marapi, 1850 m el., BÜNNEMEIJER 4575 (B, L, U), v.n.: *mangi-mangi*; G. Talang, Laras Talang, 1500 m el., BÜNNEMEIJER 5162 (B, L), v.n.: *pingago*; G. Kerintji, 2400 m el., BÜNNEMEIJER 10411 (B); Sandaran Agong, 735 m el., ROBINSON & KLOSS s.n. (S); Pondok Boenga, 2800 m el., between Kajoe Aroe and the summit, 1400—3805 m el., FREY-WYSSLING 145 (B); 2900 m el., BÜNNEMEIJER 10001 (B, L, S); Batang Soengai Manau, 200 m el., POSTHUMUS 948 (B, S, U), v.n.: *lalat*; between Moearadoewa & Martapoera, DE VOOGD 35 (B); n. of Sepatoehoe, n. side of Danau Rana, 700 m el., VAN STEENIS 3860 (B); G. Raja, nr. Danau Rana, 1300 m el., VAN STEENIS 3574 (B); G. Raté Telanggaran, 400 m el., IBOET 27 (B, L), v.n.: *pegagan*; G. Tanggamoes, 1400 m el., DE VOOGD 171, 172 (B); estate Wai Rilau, 20 km east of Tandjoeng Karang, 50 m el., agronomist S. Sumatra s.n. (B).

BORNEO. Mt. Kinabalu, Dallas, 900 m el., CLEMENS 26382 (B); bed of Dahombang, 900 m el., HAVILAND 1273 (Sa); Panataran River basin, 1050—1200 m el., CLEMENS 32597 & s.n. (B); Colombon River basin, 2700—2850 m el., CLEMENS 33729 (B); Penibukan, Dahobang, 1200 m el., CLEMENS 30684 (B); Penibukan, 1200—1500 m el., CLEMENS s.n. (B); between Mensangau and Renagong, 600 m el., GIBBS 3038 (BM); Central Borneo, Boekit Tjihan, AMDJAH (Exp. NIEUWENHUIS) 289 (B); Oeloe Bloeöe, Mahakam Region, AMDJAH (Exp. NIEUWENHUIS) 278 (B); 20 km w. of Bontang, 100 m el., RUTTEN 468 (B, U); S.E. Borneo, KORTHALS s.n. (L); between Batoe Babi & Loemawia, HUBERT WINKLER 2869 (B, BD, L, S); West Koetai, Long Temelen, 200 m el., ENDERT 2890 (B); Long Petah, 450 m el., ENDERT 3256 (B); W. Koetai, Kong Kemoel, 1700 m el., ENDERT 4539 (B).

JAVA. Without exact locality: REINWARDT s.n. (L); ZIPPELIUS s.n. (L); ZOLLINGER 127 (BM); BLUME s.n. (L), v.n. *doelan sentak*; KORTHALS s.n. (L); JUNGHUHN s.n. (L), partly authentic of *Hydrocotyle podantha* MOLKENBOER; NAGEL 259 (BD); WAITZ s.n. (L); HASSKARL 131? (B); v.n. *doelan sontak*; „Doekoetan", 1150 m el., MOUSSET 647 (B); Kapadoengan, VAN HASSELT s.n. (L); G. Karang, above Pandeglang, 500 m el., BACKER 7365 (B); Bodjongmanik, KOORDERS 40769 β (B); G. Paniis, s. of Djasinga, 450 m el., BACKER 10421 (B, L); Nirmala, 1500 m el., BACKER 10695 (B, L); Salak (?), BLUME s.n. (L), authentic of *Hydrocotyle sundaica* BLUME; Soekamantri, above Buitenzorg, 550 m el., BAKHUIZEN VAN DEN BRINK 3658 (B, L, U), v.n. *doelang sontak*; Salak, n. slope nr. Waroengloa, 650 m el., DANSER 6628 (G); Kotabatoe nr. Tjiomas, BOERLAGE s.n. (L), v.n. *daoen sentak, doelang sontak*; 350 m el., DE MONCHY s.n. (B, L); Buitenzorg, 235 m el., HALLIER s.n., 129a (B, L), v.n. *doelang sontak*; 250 m el., VAN STEENIS 1524 (B); Goea si Gadjah, 250 m el., BACKER 31180 (B); Kalapa Noenggal, 300—500 m el., BACKER 23422, 5940 (B); Pasir Karet, above Gadok, 800 m el., BACKER 31919 (B); Poentjak, Eurad, 1200 m el., WISSE 1001 (B); Boerangrang, Wanajasa, s.e. of Poerwakarta, 1000 m el.,

BAKHUIZEN VAN DEN BRINK 4659 (B, L); Sindanglaja, PLOEM s.n. (L); Lemak Goenting, nr. Bandoeng, DOCTERS VAN LEEUWEN s.n. (B); Tjibeureum, nr. Bandoeng, 1550 m el., SMITH & RANT 40 (B); Boekit Toengoel, 1200—1650 m el., ZOLLINGER 2008 (BD), „*Hydrocotyle globata* BL., ZOLL., Cat. 139"; Palaboehanratoe, PLOEM s.n. (L); KOORDERS 33176 β (B), v.n. *dolong sontok*; Tjikidang nr. Paloeboehanratoe, 540 m el., BAKHUIZEN VAN DEN BRINK 271 (B, L); Tjiëmas, 500 m el., BACKER 25595 (B); Tjitjoeroeg, Tjitjibo, Tjidadap, Tjibeber, 800 m el., BAKHUIZEN VAN DEN BRINK, 2830 (B, L, U); Tjidadap nr. Tjibeber, 900—1000 m el., BACKER 22379 (B); Tjisokan valley, nr. Tjibeber, 750 m el., BAKHUIZEN VAN DEN BRINK 826 (B); G. Tjikoekoer, nr. Telaga Patengan, 1450 m el., LÖRZING 1431 (B); G. Patoeha, Tjiwidej, 1750 m el., COSTER 99 (B); s. slope, 2000 m el., LÖRZING 1341 (B); 2400 m el., BACKER 12767 (B); G. Malabar, WICHURA 2138 (BD); DOCTERS VAN LEEUWEN s.n. (B); Tjisoeroeli, 1320 m el., FORBES 936 (BD, BM, L), v.n.: *daoon sentok, doelang sentok*; 1400—2000 m el., DENKER 92 (B); 1500 m el., PULLE 3154 (U); Tjinjiroean, RANT s.n. (B); 1550 m el., RANT & SMITH 133 (B); Taloen, s. of Bandoeng, 1600 m el., REYNVAAN s.n. (B); 1700 m el., PULLE 3091 (U); 2100 m el., VAN DER PIJL 258 (B); G. Wajang, nr. Pengalengan, WARBURG 11243 (BD); G. Kentjana, s. slope, 1800 m el., VAN DER PIJL 401 (B); Kendeng G. Oeroeg, 2000 m el., SMITH & RANT 356 (B); G. Papandajan, s.w. slope, 1500 m el., BACKER 5491 (B); Tegal Pandjang, 2045 m el., VAN STEENIS 4340 (B); Garoet, BURCK s.n. (L); G. Goentoer, forest nr. Kawah Manoek, 1550 m el., DANSER 6806 (B); G. Kratjak, BURCK 510 (B), v.n.: *djoelang sontok*; G. Poetri nr. Garoet, 900 m el., KOENS 116 (B); G. Djaja, 1460 m el., LAM 197 (B); G. Telagabodas, above Pangentjongan, 1200 m el., BACKER 31918 (B, L); Bivouac Denoe on the Tji Patoedja, 400 m el., BACKER 8927 (B, L); G. Tjeremai, BLUME l.c.; G. Slamet, above Batoe Raden, 700 m el., BACKER 433 (B); Petoengkriana, 1600 m el., BACKER 15892 (B); Josoredjo, 1400—1600 m el., BACKER 16111 (B); Diëng, JUNGHUHN s.n. (L), authentic of *Hydrocotyle podantha* MOLKENBOER; G. Oengaran, slope of Soerolaja, 700 m el., DE VISSER SMITS s.n. (B); Oengaran, 900—1200 m el., Medini, JUNGHUHN s.n. (L), v.n.: *goepogatel*; 1500 m el., n. slope, DOCTERS VAN LEEUWEN s.n. (B); G. Telamaja, KOORDERS 28052 β (B), v.n.: *poeser boemi*; Pringombo, KOORDERS 27126β (B), v.n.: *semonggen*; Serajoe valley, Mangli, 700 m el., BRINKMAN 321 (B); G. Soembing, Potorono Mts., 800 m el., LÖRZING 106 (B, BD); Djiwa, n. of G. Merbaboe, 1500 m el., DOCTERS VAN LEEUWEN 1137 (B); G. Lawoe, above Djagaraga, 600 m el., BACKER 6745 (B, L); G. Wilis, above Kediri, 1250 m el., BACKER 11362 (B); G. Andjasmoro, estate Pengandjaran, HOEDT s.n. (B); n. of Poedjon, 1300 m el., ARENS s.n. (B); G. Ardjoeno, Trètès, 800 m el., BREMEKAMP s.n. (B); G. Kawi, G. Keloed, Tapoh Walo, WARBURG 4228 (BD); G. Kawi above desa Printji, 2100 m el., ARENS s.n. (B); n.w. of Poenten, 1100 m el., VAN STEENIS 2500 (B); Bantaran, Proefstation Malang 1 (B); G. Tengger, northern slope nr. desa Ngepoeh, 1100 m el., VAN HARREVELD-LAKO 25 (B); Nangkadjadjar, 1200 m el., WISSE 546 (B); 1250 m el., JESWIET 569 (B); G. Tengger, 1200 m el., BUYSMAN 403 (U); w. slope, 1200 m el. & higher, MOUSSET 248 (B, BD); G. Seméroe, s.w. slope, 1000 m el., BACKER 3634 (B, L); between Smeroe-hoeve & Sendoera, 1300 m el., VAN STEENIS 7342 (B); Soerabaja, 800 m el., hot spring at Patjet, ALTMAN 64 (B); G. Argapoera, n.w. slope, 1200 m el., BACKER 13225 (B); Katjep, OTTOLANDER 343 (B), v.n.: *ramboan*; G. Idjen, Pantjoer, 1000 m el., OTTOLANDER 286 (B), v.n.: *mankok, telpok*; way to Idjen Highlands, 1300 m el., RANT s.n. (B); G. Kendeng above Kajoe-

mas, 1100 m el., BACKER 30732 (B); 1400 m el., BACKER 24909 (B); G. Idjen, w. slope, 1400 m el., BACKER 25375 (B); Gendingwaloeh, 1450 m el., KOORDERS 43159β (B); Kendeng, forest Pantjoer-Idjen, KOORDERS 28557 β (B); 1400 m el., KOORDERS 21378 β (B); 1450 m el., KOORDERS 32668β v.n.: *koes-ti-koesan* (B); G. Raoeng, s.w. slope, 2000 m el., VAN DER PIJL 128 (B); 1300 m el., CLASON 164 (G).

MADOERA. SAULIÈRE 135 (BD).

SELEBES. G. Klabat, 1300—1600 m el., KOORDERS 19036 β (B); Tondano, 690 m el., WISSE 40 (B); nr. Kajoewatoe, KOORDERS 19032 β (B), v.n.: *kaki koeda rinteh, doelang sontok*; Ratahan, KOORDERS 19035 (B), v.n.: *lalampang kawajoe, kaki koeda*; Bojong, WARBURG 15174 (BD); Lokon, SARASIN 466 (BD); Tjamba, TEYSMANN 12363 H.B. (B, L); Raoelo, 900 m el., BÜNNEMEIJER 12586 (B, L); Lombasang, 950 m el., BÜNNEMEIJER 10990 (B, L, U); G. Bantaèng, 1800 m el., BÜNNEMEIJER 12372 (B); Todjamboe, 800 m el., KJELLBERG 1697 (B).

SERAN. Mahoeala Ina, 200—300 m el., KORNASSI 731 (B, L, U).

JAPEN. 300 m el., STEIN 38 (BD).

NEW GUINEA. Arfak Mts., Angi Lakes, nr. Woman Lake, 2100 m el., GIBBS 5650 (BM); Nassau Mts., 1200 m el., DOCTERS VAN LEEUWEN 10790 (B); Cyclope Mts., MAYR 547 (B, BD); Alkmaar, VERSTEEG 1497 (B), original of *Hydrocotyle Versteegi* HEMSLEY; Kloof Bivouac, PULLE 157 (B); Oroh Valley, PULLE 1146 (B); Hellwig Mts., VON RÖMER 1189 (B); on the Noord-Rivier, VON RÖMER 375 (B); Utakwa Expedition, Camp VIc, 1650 m el., KLOSS s.n. (S); Kaiser Wilhelms Land, HELLWIG 633 (B); Hunsteinspitze, 1350 m el., LEDERMANN 10955 (BD); 1400 m el., LEDERMANN 11055a (BD); Schraderberg, 2070 m el., LEDERMANN 12064 (BD); Station Felsspitze, LEDERMANN 12391 (BD); Finisterre Mts., HELLWIG 357 (BD), cotype of *Hydrocotyle novoguinensis* WARBURG; 1200 m el., SCHLECHTER 18172 (BD); Sattelberg, WARBURG 20465 (BD); Junzaing, 800—1500 m el., MAYR 722 (BD); 800 m el., NYMAN 666 (BD); 850 m e.l, NYMAN 474 (BD); Saruwaged Mts., Ogeramnang, 1800 m el., MAYR 810 (BD); Bismarck Mts., SCHLECHTER 14050 (B); Mt. Tafa, 2400 m el., BRASS 5005 (NY).

Distribution: from the Himalaya, China and Formosa in the North to the Solomon Islands in the East and Australia and Tasmania in the South; also in tropical Africa.

2. **Hydrocotyle sibthorpioides** LAMARCK — Herb; stems long-creeping or with ascendent extremities, sometimes almost caespitose, terete, thin or almost filiformous, glabrous or sparsely hairy, rarely densely hairy. Leaves petiolate and stipulate; stipulae 0.5—1 mm long, nearly 1.5 mm broad, ovate to obovate, acute, membranous, ciliate almost fringed or entire; petiole 0.5—6 cm long, or even shorter in the uppermost leaves, filiformous, more or less hairy with spreading or more or less reflexed hairs; lamina 0.3—2.5 cm long and broad, roundish to 5-angular in outline, deeply cordate, 3—5-lobed to 3—5-partite, the segments crenate to serrate, both surfaces more or less pilose to hirsute. Inflorescences along the creeping stems, single; peduncle 0—3 cm long, filiformous, glabrous or short-hairy; involucre with 4—10 bracts, nearly 1 mm long 0.5 mm broad, around and between the flowers, ovate-lan-

ceolate, acute, with 2 acute teeth at the base up to 0.5 mm long, sometimes filiformous, the lower ones reflexed when fruit-bearing. Flowers sessile or very shortly pedicelled, usually 10—15 in each inflorescence; calyx teeth none; petals nearly 0.75 mm long, 0.5 mm broad, ovate, acute, valvate; styles nearly 0.5 mm long. Mericarps 1—1.25 mm long, 0.75 mm broad, yellow to brown, never black, glabrous or with short stiff hairs, sometimes red-punctate; marginal ribs more or less prominent.

For the distinction of this species from *H. javanica* cfr. the latter.

Hydrocotyle sibthorpioides LAMARCK, Enc. méth., bot., 3 (1789) p. 153; PERSOON, Synops., 1 (1805) p. 302; RICHARD, in Ann. Gén. Sc. Phys., 4 (1820) p. 56, ic. 54, pl. 8; D. C., Prodr., 4 (1830) p. 66; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 39; BAKER, Fl. Maurit. & Seych. (1877) p. 132; CLARKE, in HOOKER FIL., Fl. Br. Ind., 2, p. 669 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 613; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 119 (1898); HEYNE, Nutt. pl. Ned. Ind., ed. 1, 3 (1917) p. 394; MERRILL, En. Phil. Fl. Pl., 3, p. 237 (1923); BACKER & VAN SLOOTEN, Jav. Theeonkr. (1924) p. 184; OCHSE, Trop. groenten (1925) p. 190, cum ic.; JOCHEMS, in Trop. Nat., 15 (1926) p. 69; HEYNE, Nutt. pl. Ned. Ind., ed. 2 (1927) 2, p. 1210; VAN STEENIS, in Trop. Nat., 17 (1928) p. 200; SCHRÖTER & BACKER, in Festschr. Hans Schinz (1928) p. 579; VAN STEENIS, in Trop. Nat., 19 (1930) p. 84; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. 3, suppl. 1 (1930) p. 164; ALSTON, in TRIMEN, Handb. Fl. Ceyl., 6 (1931) p. 137; CRAIB, Fl. siam. enum. 1, p. 787 (1931); OCHSE & BAKH., Ind. groenten (1931) p. 714, ic. 433; BACKER, Onkruidfl. Jav. Suikerrietgr., p. 473 (1931); BURKILL, Dict. Econ. Prod. Mal. Pen. (1935) 1, p. 1212; *Hydrocotyle nitidula* RICHARD, Ann. Gén. Sc. Phys., 4, p. 60, t. 63, fig. 33 (1820); J. W. HOOKER, Exot. Fl., 1 (1823) t. 29; D. C., Prodr., 4 (1830) p. 66; HASSKARL, Cat. pl. Hort. Bot. Bogor. (1844) p. 163; ZOLL. & MOR., in MORITZI, Syst. Verz. 1842—1844 (1845—46) p. 42; MOLKENB., in MIQUEL, Pl. Junghuhn., p. 92 (1851); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848, p. 138 (1854); MIQUEL, Fl. Ind. Bat., I, 1, p. 735 (1856); THWAITES, Enum. pl. Zeyl. (1859) p. 130; MIQUEL, Fl. Ind. Bat., suppl. Sum. (1860) p. 134; HIERN, in Fl. Trop. Afr., 3, p. 5 (1871); FILET, Plantk. Woordenb. (1876) p. 19; DRUDE, in Engl. & Pr., Nat. Pflanzenfam., III, 8, p. 119 (1898); DE CLERCQ, Plantk. Woordenb. (1909) p. 258; *Hydrocotyle ranunculoides* var. *incisa* BLUME, Bijdr. Fl. Ned. Ind., 15 (1826) p. 884; HASSKARL, Cat. pl. Hort. Bot. Bogor. (1844) p. 163; *Hydrocotyle splendens* BLUME, Bijdr. Fl. Ned. Ind., 15 (1826) p. 884; D. C., Prodr., 4 (1830) p. 66; HASSKARL, Cat. pl. Hort. Bot.

Bogor. (1844) p. 163; Aanteek. Nut. (1845) p. 3, 59; MIQUEL, Fl. Ind. Bat., I, 1, p. 734 (1856); TEYSM. & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 165; FILET, Plantk. Woordenb. (1876) p. 19; DE CLERCQ, Plantk. Woordenb. (1909) p. 258; *Hydrocotyle hirsuta* var. *minuta* BLUME, Bijdr. Fl. Ned. Ind., 15 (1826) p. 884; RIDLEY, in Journ. Mal. Br. Roy. As. Soc., 1, p. 63 (1923); *Hydrocotyle rotundifolia* D. C., Prodr., 4 (1830) p. 64; ROXB., Fl. Ind., ed. 2, 2 (1832) p. 88; ed. 3 (1874) p. 270; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 668 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 613; TRIMEN, Handb. Fl. Ceyl., 2 (1894) p. 275; DRUDE, in Engl. & Pr., Nat. Pflanzenfam., III, 8, p. 119 (1898); MATS. & HAYATA, Enum. pl. Formos. (1906) p. 171; HAYATA, Fl. mont. Formos. (1908) p. 102; DE CLERCQ, Plantk. Woordenb. (1909) p. 258; ELMER, Leafl. Phil. Bot., 2, p. 629 (1909); KOORDERS-SCHUM., Syst. Verz., 1, fam. 228, p. 97 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 722; HAYATA, Ic. pl. Formos., 2 (1912) p. 50; VAN DONGEN, Overz. geneesmidd. Ned. Ind. (1913) p. 132; KOORD.-SCHUM., Syst. Verz., 3 (1914) p. 99; BOLDINGH, Zakfl. landbouwstr. Java (1916) p. 174; RIDLEY, in Journ. F. M. S. Mus., 8, IV (1917) p. 41; Fl. Mal. Pen., 1 (1922) p. 870; KOORDERS, Fl. Tjibodas, 2, p. 231 (1923); CHERMEZON, in LECOMTE, Fl. Indo-Ch., 2, p. 1137 (1923); *Hydrocotyle hirsuta* (non Sw., nec. SPRENG.) D. C., Prodr., 4 (1830) p. 67; MOLKENBOER in MIQUEL, Pl. Jungh., p. 92 (1851); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848, p. 138 (1854); MIQUEL, Fl. Ind. Bat., I, 1, p. 732 (1856) cum var. *glabrata*; Ill. Fl. Arch. Ind. (1871) p. 37; FILET, Plantk. Woordenb. (1876) p. 336; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 613; KOORDERS, in Nat. Tijdsch. Ned. Ind., 60 (1901) p. 370; DE CLERCQ, Plantk. Woordenb. (1909) p. 258; ERNST, Vegetationsbilder, 7. Reihe, 1—2 (1909) t. 9 & 10; VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 389 (1935); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848, p. 138, 140 (1854); MIQUEL, Fl. Ind. Bat., I, 1, p. 733 (1856); FILET, Plantk. Woordenb. (1876) p. 268; DRUDE, in Engl. & Pr., Nat. Pflanzenfam., III, 8, p. 118 (1898); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 721; *Hydrocotyle Zollingeri* MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 91 (1851); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 138; MIQUEL, Fl. Ind. Bat., I, 1, p. 733 (1856); suppl. Sum. (1860) p. 134; TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 165; FILET, Plantk. Woordenb. (1876) p. 147; *Hydrocotyle puncticulata* MIQUEL, Fl. Ind. Bat., I, 1, p. 732 (1856); *Hydrocotyle benguetensis* & *H. delicata* ELMER, Leafl. Phil. Bot., 2, p. 628, 629 (1909); MERRILL, Enum. Phil. Fl. Pl., 3 (1923) p. 237.

Hydrocotyle sibthorpioides is spread throughout the area dealt with in this paper and is found from 0 to 3680 m elevation. It is very variable as to the shape of the leaves, the depth of the incisions, and the hairiness of all parts. Many of the forms have been described as separate species, but as these forms are connected by all kinds of intermediates I agree with those authors who keep them all together under one specific name.

MALAY PENINSULA. Penang, Penara Bukit, 300 m el., CURTIS 1752 (S), v.n.: *pegaga*; Perak, Maxwell's Hill, 1110 m el., BURKILL & HANIFF 12915 (S); Johore, Mt. Austin, VESTERDAL s.n. (S); Singapore, Botanic Garden, TASSIM DAUD s.n. (S), v.n.: *kara-kara*; RIDLEY s.n. (S).

BATOE ISLANDS. Pulau Pini, shore, RAAP 624 (B).

SUMATRA. Sibolangit, 500 m el., LÖRZING 5271 (B, L, U); Karo Plateau nr. Berastagi, 1350 m el., LÖRZING 6071 (B); Piso-Piso, 1400—1500 m el., LÖRZING 9367 (B); Seriboe Dolok, 1420 m el., LÖRZING 9808 (B); Toba above the Air Bongbong valley, RUTTNER 258 (B); Karo Plateau nr. Raja, 1275 m el., LÖRZING 4826 (B); nr. Lingga, 1225 m el., LÖRZING 6245 (B); nr. Deleng Siosar, 1350 m el., LÖRZING 8564 (B); Habinsaran Plateau, 1200—1300 m el., LÖRZING 6557 (B); Pangoeroeran (Samosir), 910 m el., LÖRZING 7660 (B); Loeboek Raja, nr. Padang Sidempoean, DE VOGEL s.n. (B); Padang, KORTHALS s.n. (L); Danau-di-Atas, RUTTNER 259 (B); Siolak Daras, 900 m el., RIDLEY l. c.

BORNEO. Sarawak, Upper Rejang River, Kapit, CLEMENS 21268 (B); Kuching, CLEMENS 22309 (Sa); S. Borneo, Bandjarmasin, MOTLEY 238 (K).

JAVA. Without exact locality: JAGOR 684 (BD); HORSFIELD s.n. (U), authentic of *Hydrocotyle punctioulata* MIQUEL; HILLEBRAND s.n. (BD); BLUME s.n. (L), authentic of *Hydrocotyle splendens* BLUME; JUNGHUHN s.n. (L); ZOLLINGER 834 (L), original of *Hydrocotyle Zollingeri* MOLKENBOER; HASSKARL 131 (B), v.n.: *antannan lumboet, kakatoen djaran*; „Kapandongan", VAN HASSELT s.n. (L); Pal Mérah nr. Batavia, 20 m el., BACKER 32151 (B); Salemba nr. Batavia, 15 m el., BACKER 32150 (B); Buitenzorg, 240—250 m el., HEYNE s.n. (B); BOERLAGE s.n. & 108 (L), v.n.: *roempoet tikoes*; HALLIER 128a, 128b, 128d (B), v.n.: *antanan lemboet*; DANSER 5405 (G); VAN STEENIS 483 (B); Tjiomas, HALLIER 128c (B); above Pasir Pogor, BAKHUIZEN VAN DEN BRINK 5549 (B, L), v.n.: *antanan beurit*; Parakansalak, WARBURG s.n. (BD); Tjibodas, 1350—1425 m el., BURKILL 8252 (S); KOORDERS 31695 β, 32086 β (B), v.n.: *koerawet galeng*; SAPIIN 2064 (B); HALLIER 146, 240 (B); VAN STEENIS 2064 (B); Sindanglaja, PLOEM 118 (BD); G. Boerangrang nr. Wanajasa, 700 m el., BACKER 14227 (B); G. Tangkoebanprahoe, Lembang, 1200 m el., VAN STEENIS 1657 (B); 1900 m el., DOCTERS VAN LEEUWEN 11454 (B); Tjiareuj nr. Tjibadak, 600 m el., BAKHUIZEN VAN DEN BRINK 272 (B, L), v.n.: *antanan beurit, koerawet galeng, antanan lemboet*; Palaboehanratoe, KOORDERS 33163 β (B); between Soekaboemi & Njalindoeng, 600 m el., BACKER 14566 (B); Tjidadap nr. Tjibeber, 900 m el., BAKHUIZEN VAN DEN BRINK 7010 (B), v.n.: *antanan beurit, koerawed galeng, antanan lemboet*; ibidem 1000 m el., WINCKEL 1131 β (B), 1134 β (B, L), v.n.: *antanan beurit*; BAKHUIZEN VAN DEN BRINK 7011, 6700 (B), v.n.: *antanan beurit*; Leuwimanggoe, nr. Tjibeber, 780 m el., SIKAJA s.n. (B), v.n.: *antanan leutik*; G. Patoeha, Telaga Patengan, WARBURG 3119 (BD); 1600 m el., BACKER 12815 (B); Tjinjiroean, 1600 m el., DOCTERS VAN LEEUWEN s.n. (B); G. Malabar, s. slope, 1585 m el., RANT s.n. (B), v.n.: *antanan*

beurit; Tjibeureum nr. Pengalengan, 1550 m el., SMITH & RANT 66 (B); G. Ipis, Tegal Primula, 2300 m el., DOCTERS VAN LEEUWEN 13337 (B); G. Papandajan, Tegal Kirinjoeh, 2060 m el., VAN DER PIJL 542 (B); Tegal Aloen-aloen, upper course Tji Paroegpoeg, 2350—2500 m el., VAN STEENIS 4066 (B); Tjisangiri, WERKMAN s.n. (B), v.n.: *antanan beurit*; between Garoet & Waspada, 850 m el., BACKER 5296 (B); nr. kota Garoet, KOORDERS 37090 β (B); Garoet, BURCK s.n. (B); Doro, 500 m el., DOCTERS VAN LEEUWEN 463 (B); Petoengkriana, 1600 m el., BACKER 15917 (B); Josoredjo, 1500 m el., BACKER 16118 (B); G. Slamet, above Batoeraden, 700 m el., BACKER 432 (B); Poerwokerto, 75 m el., BACKER 74 (B); Diëng Plateau, 1800—2500 m el., VAN SLOOTEN 416, 339, 394 (B); JUNGHUHN s.n. (L), v.n.: *rendeng*; TEYSMANN s.n. (B), v.n.: *oetjie-oetjie*; DOCTERS VAN LEEUWEN 2256 (B); BACKER 21697 (B), v.n.: *andem*; WIRJOSAPOETRO 25 (L), v.n.: *djarem*; Wanasaba, 800 m el., BRINKMAN 322 (B); Moentilan, 350 m el., VAN RIJCKEVORSEL 87 (B); Kalitrotjok, above Tjandiroto, 800 m el., LÖRZING 295 (B, BD); Temanggoeng, 550 m el., LÖRZING 248 (B, BD); G. Oengaran, above Padanglawas, Medini, 900—1200 m el., JUNGHUHN s.n. (L), v.n.: *soemoed kali, samangi goenong*, original of *Hydrocotyle Zollingeri* MOLKENBOER; G. Telamaja, KOORDERS 28051β (B), v.n.: *katèpan*; Sepakoeng, 1000 m el., KOORDERS 42610 β (B), v.n.: *katepan*; G. Merapi, above Sèlo, WARBURG 4226 (BD); Prigi, 5 m el., BACKER 11881 (B); above Malang, 1100 m el., HOFSTEE 29 (B); G. Seméroe, between Kaliglidik & Ampelgading, 700—800 m el., BACKER 3566 (B); G. Seméroe, 1200—1500 m el., ZOLLINGER 2315 (B, BD); G. Tengger, KJELLBERG s.n. (B); nr. Goeboegklakah, 600—1500 m el., ZOLLINGER 2542 (B, BD), v.n.: *samangi*, original of *H. latiseota* ZOLL.; above Lawang, MOUSSET 116 (B); Bodo Gendro, 900 m el., MÜLLER, Herb. Jav. 110 leg. MOUSSET (L); Tosari, 1800—2500 m el., BACKER 8395 (B); KOBUS s.n. (B); WARBURG 4229 (BD); way to Penandjaan, 2000 m el., DOCTERS VAN LEEUWEN 4583 (B); Ngadisari, 2000 m el., KOORDERS 37877 β (B); Moeroredjo, above 2000 m el., MOUSSET 332 (B); Ijang Plateau, Songi Kolboe, 2100 m el., KOORDERS 43460β (B); 43581 β (B); 2200 m el., BACKER 9648 (B); Djember, 85 m el., ULTÉE 2 (B); Rawah Tapen Semboro, 28 m el., CLASON A69 (G); Bendo, OTTOLANDER 383 (B), v.n.: *pendjelongan* (jav.), *salâtoen* (mad.); Idjen Plateau, nr. Djampit, 1500 m el., BACKER 25069 (B); above Oengoep, 1800—2400 m el., CLASON E20 (B, G); Kawah Idjen, 2000 m el., KOORDERS 43161 β (B, L); G. Merapi, 1900—2200 m el., BACKER 25338 (B); 2600 m el., KOORDERS 43160 β (B).

MADOERA. Pamekasan, VORDERMAN 119 (B), v.n.: *patèkan tjèna*.

KANGEAN ARCHIPELAGO. Sepandjang, 1 m el., BACKER 29186 (B).

SELEBES. Biroro nr. Lombasang, 850 m el., BÜNNEMEIJER 11639 (B); G. Bantaèng, 2500 m el., BÜNNEMEIJER 11910 (B, L); Rante Lemo, 1000—1200 m el., KJELLBERG 1424, 1432 (B); Todjamboe, 800 m el., KJELLBERG 1723 (B); B. Rante Mario, 2700 m el., KJELLBERG 3887 (B); Tawanga, B. Watoewila, 900 m el., KJELLBERG 1009 (B).

BOEROE. Fakal, 1050 m el., L. J. TOXOPEUS 450 (B, L).

SERAN. Kaniki, 600 m el., KORNASSI 1392 (B, L).

AMBON. ROBINSON 1793 (B).

NEW GUINEA. Arfak Mts., 1800 m el., GJELLERUP 1039 (B); Mt. Tafa, 2400 m el., BRASS 4898 (NY); Wharton Range, Murray Pass, 2840 m el., BRASS 4670 (NY). Mt. Albert Edward, 3680 m el., BRASS 4475 (NY).

Distribution: thoughout tropical Asia, also in tropical Africa; South America (?).

3. **Hydrocotyle vulgaris** LINN. — Perennial herb; stem thin, creeping. Leaves petiolate, stipulate; petiole 1—9 cm long, with spreading hairs towards the limb; stipulae roundish, membranous; lamina orbicular, peltate, 0.7—3.5 cm in diameter, 8—13-nerved, coarsely crenate to slightly lobed. Inflorescences single or few together on the nodes; peduncle filiformous, 0.5—5 cm long, bearing 1—3 whorls of flowers in the apical portion, each flower with an ovate, membranous acute bract. Flowers sessile or shortly pedicelled; calyx teeth none; petals nearly 0.75 mm long, ovate, white or reddish. Fruit 1.75—2.5 mm broad, 1.5—2 mm long, transversely elliptical, densely beset with reddish small warts; stylopodium bipartite, the halves conical, bearing the styles on their apices. (Description after European and the under mentioned New Guinea plants.)

Hydrocotyle vulgaris Linn., Sp. pl., ed. 1 (1753) 1, p. 234; BENTHAM, Fl. austr., 3 (1866) p. 339; BAILEY, Queensl. Fl., 2 (1900) p. 715; SCHUMANN & LAUTERB., Fl. deutsch. Schutzgeb. (1901) p. 487; BAILEY, Compr. Catal. Queensl. Pl. (1913) p. 228; GIBBS, Contr. Arfak Mts. (1917) p. 165; HEGI, Ill. Fl. Mitteleur., V, 2, p. 952, ic. 2314a, 2316a, 2324—2328, tab. 190, fig. 5 (1925); EWART, Fl. Victoria (1930) p. 894.

NEW GUINEA. Arfak Mts., Angi Lakes, 2100 m el., GIBBS 5943 (BM, K), in open marsh, abundant in parts.

MARSHALL ISLANDS. SCHUMANN & LAUTERBACH, l. c.

Distribution: Europe, N. Africa, Australia, apparently not occurring on the Asiatic Continent.

II. CENTELLA.

Solandra LINN., Syst. nat., ed. 10 (1757) p. 1269; *Centella* LINN., Pl. afr. rar. (1760) p. 28; URBAN, in MART., Fl. bras., XI, 1, p. 286 (1879); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 119 (1898); DOMIN, in Bot. Jahrb., 41, p. 148 (1908); WOLFF, in ENGL. & PR., Nat. Pflanzenfam., Nachtr. 3 (1908) p. 256; *Hydrocotyle* sect. *Centella* BENTHAM, Fl. austr., 3 (1866) p. 338; BENTH. & HOOK.F., Gen. pl., 1, p. 873 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 669 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 614.

Though the name *Solandra* is the oldest valid one for this genus, I accept the name *Centella,* as the latter has been proposed as a nomen conservandum, and probably will be accepted as such. Cfr. DOMIN, l. c., GREEN, in Kew Bull., 1935, p. 496.

Only species:

1. **Centella asiatica** (LINN.) URBAN — Perennial herb; stems creeping with long stolones, more or less puberulous in the young state. Leaves in rosettes; petiole 1—40 cm long, sometimes puberulous; lamina 1—7 cm in diameter, roundly-reniformous, crenate or crenate-dentate. Inflorescences umbellate, single or 2—5 together, in the axils of nearly 3 mm long bracts; peduncle 0.5—5 cm long, always shorter than the petioles; flowers usually 3, the middle one sessile, the lateral ones pedicellate; involucre 2-leaved, 3—4 mm long, nearly 1.5 mm broad, ovate. Calyx teeth none; petals 1—1.5 mm long, 0.75—1 mm broad, imbricate. Mericarps about 2 mm long, 1.5 mm broad, laterally compressed, often somewhat hairy in the young state, the ribs connected by transverse veins.

Hydrocotyle asiatica LINN., Sp. pl., ed. 1 (1753) 1, p. 234; BURMANN, Fl. ind. (1768) p. 74; HOUTTUYN, Nat. Hist., II, 8 (1777) p. 14; BLUME, Cat. (1823) p. 49; Bijdr. Fl. Ned. Ind., 15 (1826) p. 882, cum var. *subrepanda* & *lunata*; D. C., Prodr., 4 (1830) p. 62; WIGHT & ARN., Prodr. (1834) p. 366; HASSKARL, Cat. Pl. Hort. Bot. Bogor. (1844) p. 163, cum var. *glabriuscula* & *subrepanda*; Aant. Nut (1845) p. 3; ZOLLINGER, in Nat. & Geneesk. Arch. Ned. Ind., 2 (1845) p. 592; ZOLLINGER & MORITZI, in MOR., Syst. Verz. 1842—44 (1846) p. 42; MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 90 (1851); MIQUEL, Fl. Ind. Bat., I, 1, p. 731 (1856); suppl. Sumatra (1860) p. 134; BENTHAM, Fl. austr., 3 (1866) p. 346; TEYSM. & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 165; HIERN, in Fl. Trop. Afr., 3 (1871) p. 6; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 36; FILET, Plantk. Woordenb. (1876) p. 5; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 669 (1879); BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 204; SCHUMANN, in Bot. Jahrb., 9, p. 213 (1888); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 614; WARBURG, in Bot. Jahrb., 13, p. 397 (1891); GRESHOFF, Nutt. Pl. Ned. Ind. (1894) p. 29, cum ic.; SMITH, in Teysmannia, 6, p. 152 (1895); KOORDERS, Versl. Dienstr. Minah. (1898) p. 487; BAILEY, Queensl. Fl., 2 (1900) p. 716; KING, Mat. Fl. Mal. Pen., 13 (1902) p. 599; MATS. & HAYATA, Enum. pl. Formos. (1906) p. 169; VALETON, in Bull. Dép. Agr. Ind. Néerl., 10 (1907) p. 43; DE CLERCQ, Plantk. Woordenb. (1909) p. 257; VAN DONGEN, Overz. Geneesm. Ned. Ind. (1913) p. 131; RIDLEY, Fl. Mal. Pen., 1 (1922) p. 869; in Journ. Mal. Br. Roy. As. Soc., 1, p. 63 (1923); EWART, Fl. Victoria (1930) p. 896; BURKILL, Dict. Econ. Prod. Mal. Penins., 1, p. 1210 (1935); ***Trisanthus cochinchinensis*** **LOUREIRO, Fl. cochinch., 1 (1790) p. 176;** ***Centella asiatica*** **URBAN, in MART., Fl. bras., XI, 1, p. 287, t. 78, fig. 1 (1879); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 119, ic. 47J**

(1898); SCHUM. & LAUTERB., Fl. deutsch. Schutzgeb. (1901) p. 486; DOMIN, in Engl., Jahrb., 41, p. 158 (1908); KOORDERS-SCHUM., Syst. Verz., 1, fam. 228, p. 96 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 723; KOORDERS-SCHUM., Syst. Verz., 3 (1914) p. 100; BOLDINGH, Zakfl. Landbouwstr. Java (1916) p. 174; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 395; GIBBS, Contr. Arfak Mts. (1917) p. 164; MERRILL, Interpr. Rumph. Herb. Amb. (1917) p. 411; DOCTERS VAN LEEUWEN, Hand. Eerste Ned. Ind. Natuurwet. Congres (1919) p. 60, 71; MERRILL, Bibl. Enum. Born. Pl. (1921) p. 458; DOCTERS VAN LEEUWEN, in Ann. Jard. Bot. Buitenz., 31, p. 130, 137 (1921); 32, p. 189 (1923); KOORDERS, Fl. Tjibod., 2, p. 231 (1923); MERRILL, Enum. Phil. Fl. Pl., 3 (1923) p. 238; CHERMEZON, in LECOMTE, Fl. Indo-Ch., 2, p. 1134, ic. 135, 1—3 (1923); NANNFELDT, in Svensk. Bot. Tidskr., 18, p. 422 (1924); BACKER & VAN SLOOTEN, Handb. Jav. Theeonkr. (1924) p. 185; BAKER FIL., in Journ. Bot., 62, suppl., p. 44 (1924); OCHSE, Trop. groenten (1925) p. 185, cum ic. p. 187; JOCHEMS, in Trop. Nat., 15 (1926) p. 69, ic. 5; HEYNE, Nutt. pl. Ned. Ind., ed. 2, 2 (1927) p. 1210; KOOPER, in Rec. trav. bot. néerl., 24, p. 60 (1927); DOCTERS VAN LEEUWEN, Fourth Pacif. Sc. Congr., Krakatoa (1928) p. 76; SCHRÖTER & BACKER, in Festschr. Hans Schinz (1928) p. 561, 571; JOCHEMS, in Meded. Deli Proefstat. ser. II, 59, p. 64, 68 (1928); LAUTERBACH, in Bot. Jahrb. 63, p. 18 (1929); DOCTERS VAN LEEUWEN, in Bull. Jard. Bot. Buitenz., sér. III, 11, p. 35 (1930); DAKKUS, in Bull. Jard. Bot. Buitenz., sér. 3, suppl. 1 (1930) p. 64; VAN STEENIS, in Trop. Nat., 19 (1930) p. 85; CRAIB, Fl. siam. enum., 1, p. 786 (1931); BACKER, Onkr. Suikerrietgr., p. 474 (1931); OCHSE & BAKHUIZEN, Ind. groenten (1931) p. 701, ic. 426; DOCTERS VAN LEEUWEN, in Ann. Jard. Bot. Buitenz. 46—47 (1936) p. 404; *Hydrocotyle hebecarpa* D. C., Prodr., 4 (1830) p. 63; *Hydrocotyle asiatica* var. *hebecarpa* HASSK., Pl. jav. rar. (1848) p. 459; ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 138; *Hydrocotyle asiatica* var. *pedunculata* Kuntze, Rev. gen. pl., 1 (1891) p. 268.

This pantropic species is rather uniformous. It appears to occur all over Malaysia, and is found there from sea level to 2450 m altitude. After the depth of the basal incisions of the leaves and the more or less developed indumentum, BLUME distinguished the var.s *subrepanda* and *lunata*. HASSKARL moreover distinguished (in Cat. Hort. Bog.) a var. *glabriuscula*. Also the species *Hydrocotyle hebecarpa* D. C. mainly based on the development of the indumentum of the peduncles and the fruit, was accepted later as a variety by HASSKARL. All these varieties, however, are so little prominent among the numerous slight variations of this species, that it appears useless to name them.

MALAY PENINSULA. Penang, Waterfall, CURTIS 1885 (S), v.n.: *pegaga*; Wellesley, Prai, NUR 6204 (B, S); Perak, Grik, BURKILL & HANIFF 12375, 13740 (S), v.n.: *pegaga*; Thaiping, WRAY 1765 (S); Tapah, BURKILL & HANIFF 13966 (S), v.n.: *daun pegaga*; Telok Anson, Durian Sabatang, HANIFF 15622 (S), v.n.: *daun pegaga*; Bagan Datoh, HANIFF 16265 (S), v.n.: *pegaga*; Pahang, Bintang, BURKILL & HANIFF 16799 (S), v.n.: *pegaga*; Temerloh, HOLTTUM 24585 (S); Selangor, Ginting Simpah, 540 m el., HUME 9436 (S); Sungei Lalang Kajang, SYMINGTON 22691 (S), v.n.: *pegaga*; Malacca, Gunong Lalang, 1140 m el., RIDLEY s.n. (S); Johore, Sungei Tukong estate, GORDON SPARE 877 (S); Singapore, WICHURA 657 (BD); JAGOR 34 (BD); Sungei Jorong, RIDLEY 342 (S); Twali, RIDLEY 343 (S); Bukit Mandai, RIDLEY 3779 (S), v.n.: *pegaga*; Botanic Gardens, RIDLEY 13022 (S).

SUMATRA. Atjèh, Baleg, 1000 m el., VAN STEENIS 6092 (B); Médan, 50 m el., LÖRZING 3082 (B); Gedongdjohore, 50 m el., LÖRZING 3509 (B); Bèngkalis, Beloekang, 5 m el., BEGUIN 313 (B, L), v.n.: *praga*; Sibolangit, Botanic Garden, 400—500 m el., LÖRZING 3859 (B); Seriboe Dolok, 1420 m el., LÖRZING 9775 (B); Karo Plateau near Lingga, 1225 m el., LÖRZING 6246 (B); nr. Raja, 1275 m el., LÖRZING 4976 (B); nr. Berastagi, 1350 m el., LÖRZING 6074 (B, L, U); estate Bah Biroeng Oeloe, nr. Pematang Siantar, BEUMÉE 6D (B); Habinsaran, 1100—1300 m el., LÖRZING 6528 (B); Moeara, 900 m el., OUWEHAND 52 (B); Hoeta Gindjang, RUTTNER 257 (B); Toba Plateau, Bahal Batoe nr. Siborongborong, 900 m el., HUITEMA 13 (B), v.n.: *ampa paga*; Dolok Mangoe, 1400 m el., POLAK 104 (B); Sumatra's Westkust, KORTHALS s.n. (L); Danau Biloeloek, nr. Soengai Nanam, Alahanpandjang, 1500 m el., JACOBSON 108 (B); Fort de Kock, JACOBSON 2057 (B), v.n.: *poegago, tapah, pegaga*; Danau-di-Atas, RUTTNER 256 (B); Koemantan Koerintji, 850 m el., BÜNNEMEIJER 8115 (B); Boekit Tebakar, Kerintji, 900 m el., BÜNNEMEIJER 7932 (B, L, S), v.n.: *roempoet pegambang*; estate Negara Ratoe (Lampongs), DE VOGEL s.n. (B).

ANAMBAS & NATOENA ISLANDS. Siantan, e. of Tarempa, 50 m el., VAN STEENIS 763 (B).

BORNEO. Sandakan and vicinity, RAMOS 1848 (B); Rejang, BARTLETT s.n. (S, Sa), v.n.: *pegaga*; Upper Rejang River, Kapit, CLEMENS 21269 (B, Sa); Kuching, HAVILAND, 2045 (Sa); S.E. Borneo, between Kumam and Slinau, HUBERT WINKLER 2930 (BD); Bandjermasin, KORTHALS s.n. (L).

KRAKATAU (DOCTERS VAN LEEUWEN, l. c.); Verlaten Eiland, Casuarina-forest, DOCTERS VAN LEEUWEN 3731 (B).

JAVA. Without exact locality: REINWARDT s.n. (L); BLUME s.n. (B, L); HILLEBRAND s.n. (BD); Bantam, REINWARDT s.n. (L), v.n.: *pagagan*; G. Kantjana, KOORDERS 41187 β (B), v.n.: *antanan*; between Moentjang & Sadjira, 125 m el., BACKER 1924 (B), between Pengawoengan & Bajah, 5—50 m el., BACKER 1622 (B); Batavia, KUHL & VAN HASSELT 1 (B); Pal Mérah, BACKER s.n.? (L); Weltevreden, 15 m el., BACKER 32083 (B); Kerendang, 5 m el., BACKER 32081 (B); Kebajoran, 30 m el., BACKER 32082 (B); Bidaratjina, 20—25 m el., EDELING s.n. (B); estate Tjikoempai, e. of Poerwakarta, 110 m el., HARMSEN 96 (B); Wanajasa, 700 m el., BACKER 14223 (B); Nirmala, 1200 m el., BACKER 11143 (B); s. of Djasinga, 250 m el., BACKER 10488 (B); Kotabatoe nr. Buitenzorg, DE MONCHY s.n. (B); Buitenzorg, 250 m el., BLUME s.n. (B); BOERLAGE s.n. (L); DANSER 5511 (G); VAN HARREVELD s.n. (G), v.n.: *daun kaki koeda*; BAKHUIZEN VAN DEN BRINK 422 (B); Tjiomas, 250 m el., BAKHUIZEN VAN DEN BRINK 266 (B), v.n.: *antanan*; dèsa Bondongan,

250 m el., HALLIER 127a, 127b (B), v.n.: *antanan*; Tjigombong, 500 m el., VAN STEENIS 58 (B); Tjiampèa, 150 m el., KOORDERS 30867β (B), v.n.: *antanan*; Priangan, WARBURG 11244 (BD); G. Pangranggo, VAN HASSELT s.n. (L); Tjipanas, BLUME or HASSKARL s.n. (B); Tjibodas, 1200 m el., KOORDERS 31844β (B), v.n.: *antanan*; 1425 m el., HALLIER 237 (B, L), v.n.: *antanan*; Tjibadak, 380 m el., BACKER 659 (B); Tjidadap, s. of Tjibeber, 900 m el., BAKHUIZEN VAN DEN BRINK 27 (B), 1802 (B, L), v.n.: *antanan*; 1000 m el, WINCKEL 1147β (B, L), v.n.: *antanan*; Leuwimanggoe, s. of Tjibeber, 1000 m el., SIKAJA s.n. (B); Tangkoebanprahoe, above Lèmbang, 1600 m el., BACKER 2456 (B); Bandoeng, Tjibeureum, DOCTERS VAN LEEUWEN s.n. (B); Tagogapoe, 650 m el., LÖRZING 1107 (B); G. Semboeng, nr. Bandoeng, 1300 m el., BACKER 12327 (B); G. Telagabodas, nr. Pangentjongan, 1000 m el., BACKER 32080 (B); Noesagedé, in the Pendjaloe Lake, 720 m el., KOORDERS 47889β (B), v.n.: *antanan wangi*; estate Halimoen, 250 m el., ANONYMUS 12 (B), v.n.: *antanan*; Tjibareno, nr. Palaboehanratoe, 100 m el., WINCKEL 1866 β (B); Tjitjoeroeg, Djampang Koelon, 300 m el., BACKER 17211 (B); Njalindoeng, nr. Soekaboemi, 900—1000 m el., BACKER 14591 (B, L); Bodjong Lopang, 530 m el., BACKER 16996 (B); Takokak, 1000 m el., KOORDERS 15518 β (B), v.n. *antanan*; Telaga Patengan, 1600 m el., BACKER 12824 (B); estate Soekahati, 1250 m el., LEEFMANS s.n. (B), v.n.: *antanan*; G. Patocha, Rantja Oepas, 1750 m el., BACKER 12739 (B); nr. Rantjawalini, 1725 m el., BACKER 12543 (B); Pengalengan, nr. lake, 1350 m el., FORBES 673 (B, BD); Tjilaki, WARBURG 3120 (BD); Rantjagedé, nr. Pengalengan, 1600 m el., BACKER 26109 (B); G. Malabar, nr. Tjinjirocan, 1600 m el., RANT s.n. (B), v.n.: *antanan gedéh*; G. Goentoer, Kawah Kamodjan, 1300—1500 m el., KOENS 393 (B); G. Papandajan, BOERLAGE s.n. (L); SCHEFFER C15 (B), v.n.: *antanan*; Tegal Aloen-aloen & Tegal Boenkroeng, 2450 m el., VAN STEENIS 4158 (B); G. Mandalagiri, VAN VUUREN s.n. (B), v.n.: *antanan*; between Waspada and Tjisoeroepan, 1250 m el., BACKER 5471 (B); G. Tjikoerai, above Malèèr, 820 m el., BACKER 8667 (B); Tjisoeroepan, 1250 m el., BACKER 5590 (B); G. Tjerimai, between Linggardjati & Koeningan, 500 m el., BACKER 5042 (B); Tegal, Slawi, estate Doekoewringin, coll. estate manager no. 24 (B), v.n.:*oeles-oeles*; Pekalongan, Soebah, 200 m el., BEUMÉE 4300 (B), v.n.: *patjoel gowang, tapak djaran*; Petoengkriana, 1050 m el., BACKER 15932 (B); Madjenang, 30—100 m el., BACKER 18697 (B); Diëng, WARBURG 4225 (BD); 2000 m el., TEYSMANN s.n. (B), v.n.: *rindeng*; G. Prahoe Diëng, 2100 m el., VAN SLOOTEN 381 (B); G. Pangoran, 2000 m el., VAN SLOOTEN 379 (B), Diëng Plateau, 1900—2100 m el., BACKER 21621 (B); 1860 m el., JUNGHUHN s.n. (L), v.n.: *rendeng*; G. Panggonan Diëng, 2100 m el., BRINKMAN 278 (B); G. Soembing, 1800 m el., LÖRZING 835 (BD), v.n.: *rendeng*; G. Telamaja, KOORDERS 28039β (B), v.n.: *rendeng*; nr. Sepakoeng, KOORDERS 29654β (B), v.n.: *gagan-gagan, panegowang, patjoel gowang*; 1400 m el., KOORDERS 36320β (B), v.n.: *gagan-gagan*; Salatiga, 570 m el., BACKER 30110 (B); DOCTERS VAN LEEUWEN s.n. (B); G. Merapi, above Bajalali, BEGUIN 73 (B); above Sèlo, WARBURG 4227 (BD); Kenanti, Ngarengan, KOORDERS 35653β (B); G. Kidoel, E. of Djepitoe, 200 m el., BACKER 2800 (B); Pasanggrahan Ngebel, 700 m el., KOORDERS 23237β (B), v.n.: *kerok batoh*; G. Willis, w. slope nr. Delapa, 150 m el., WISSE s.n. (B); G. Andjasmoro, w. slope, 900 m el., WINCKEL 127β (B), v.n.: *samboeng otot banjoe*; Lawang, MOUSSET 88 (B); between Singosari & Lawang, 450 m el., KOOPER l.c.; Poenten, 1100 m el., HOFSTEE 3 (B); Nangkadjadjar, 1200 m el., WISSE 619 (B); G. Tengger, BUYSMAN

98 (U); Ranoe Rani, KOBUS 250 (B); Ranoe Kembolo, 2450 m el., WURTH s.n. (B); Ngadisari, CLASON A70 (G); G. Seméroe, between Kali Glidik & Ampel Gading, 700 m el., BACKER 3786 (B); Djatiroto, 20 m el., BACKER 8117 (B, L); between Poeger & Amboelo, 10—20 m el., BACKER 18200 (B); Poeger, KOORDERS 21379β (B), v.n.: *gagan-gagan*; Djember, 85 m el., ULTÉE 1 (B); Idjen, 1500 m el., ZOLLINGER 632 (BD, L); Pantjoer, OTTOLANDER 315 (B), v.n.: *gangagan, koeste-koesan*.

BALI. ZOLLINGER l. c.

TIMOR. D. C., l. c.; ex Mus. Paris, coll.? (BD, L); ZIPPELIUS s.n. (L).

SELEBES. Kota Manado, 0 m el., KOORDERS 19033 β (B), v.n.: *daon kaki koeda, panigowang*; Kajoewatoe, 200 m el., KOORDERS 19034β (B), v.n.: *kaki koeda, tispo*; Manado, KOORDERS 19037 β (B), v.n.: *kaki koeda*; Tondano, WARBURG 15173 (BD); Maros, WARBURG 16132 (BD); Piek van Maros, Bikeroe Lawa, WARBURG 16133 (BD); T. Manipi, WARBURG 16134 (B); Sangona, 100 m el., KJELLBERG 1153 (B); Aboeki Asinoea, 200 m el., KJELLBERG 916 (B); Rante Lemo, 1100 m el., KJELLBERG 1425 (B).

TERNATE. Lagoena, 350 m el., BEGUIN 625 (B), v.n.: *kolotide manora*.

BATJAN. WARBURG 18115 (BD), v.n.: *dawn kaki kuda*.

AMBON. Karang Pandjang, RANT 270 (B); C. B. ROBINSON, Pl. Rumph. Amb. 326 (B).

AROE ISLANDS. Dobo, JENSEN 229 (B, L).

NEW GUINEA. Without exact locality: NYMAN 204 (BD); Rouffaer River, 125 m el., DOCTERS VAN LEEUWEN 9744 (B); Hollandia, GJELLERUP 76 (B); Merauke, KOCH s.n. (B, L), v.n.: *dogouke, gogouke, andanan*; nr. Kampong Kabatiel, BRANDERHORST 251 (B); Bismarck Plain, LAUTERBACH 2838 (BD); Constantinhafen, LAUTERBACH 1275 (BD); Finschhafen, WARBURG 20464 (BD); Bumi River, WEINLAND 372 (B, BD); Astrolabe Plain, LAUTERBACH l. c.

Distribution: tropical and subtropical regions of the whole world.

III. TRACHYMENE

RUDGE, in Transact. Linn. Soc. London, ser. I, 10, p. 300 (1811); BENTHAM, Fl. austr., 3 (1866) p. 347; BENTHAM & HOOKER FIL., Gen. pl., 1, p. 873 (1867); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 614; *Didiscus* D. C., in Curt. Bot. Mag., 55, t. 2875 (1828); Mém. Ombell. (1829) p. 28, t. 4; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 120 (1898); DOMIN, in Sitzungsber. Böhm. Gesellsch. Wissensch. (1908) p. 2.

Though the mode of growth of the *Trachymene* species described in the following is indicated in the descriptions separately, it might be useful to spend a few words on it here.

Trachymene caerulea, introduced from Australia as a garden plant, is entirely different from the other species, which all are indigenous plants from mountain summits. *Tr. caerulea* is an annual herb, with a well-developed primary root with fibrous branches, without well-

developed rosettes, and with one erect stem branched in the upper portion only, the umbels forming a terminal corymb.

Of the other species, *Tr. saniculaefolia, Tr. novoguineensis, Tr. koebrensis, Tr. rigida, Tr. acrotricha,* and *Tr. erodioides* mainly agree in mode of growth. They are certainly perennials. *Tr. saniculaefolia* may be regarded as the type of this group, as more abundant and more polymorphic materials of it are available. It has a branched caudex, bearing rosettes at the extremities. From these rosettes may develop in the first place lateral rosettes, taking their origin from the axils of the upper leaves; after the dying off of the parent rosette, its persistent axis continues the caudex. In the second place the rosettes may give rise to either a single terminal umbel, or to a terminal stem bearing a number of leaves and a terminal umbel. These leafy stems usually are not erect but more or less spread, and may develop rosettes in the axils of the leaves, one or two of these forming again terminal umbels, or again leafy stems, in the latter case continuing the stem in a sympodic way.

Tr. novoguineensis is like *Tr. saniculaefolia,* but prolongated leafy stems bearing axillary rosettes are unknown hitherto.

Tr. rigida and *Tr. koebrensis* mainly agree with *Tr. saniculaefolia.* In *Tr. acrotricha* real rosettes are unknown; all stems are prolongated and leafy and the caudex probably is continued by the persistent bases of the leafy stems. Of *Tr. erodioides* the lower portions of the stems are unknown, but the sympodic stems bearing few-leaved axillary rosettes justify the supposition that its mode of growth chiefly agrees with that of *Tr. saniculaefolia.*

A second group of species is formed by *Tr. celebica* and *Tr. Sarasinorum,* not much differing, however, in mode of growth from the preceding. The structure of the caudex and of the basal rosettes is the same, but the leafy stems, developing from the rosettes, never bear axillary rosettes and always a terminal corymbiform dichasium of umbels.

A third group is formed by *Tr. acerifolia, Tr. arfakensis, Tr. papillosa* and *Tr. adenodes.* The subterranean parts of these plants are not adequately known in any of these species, hence it is unknown, whether the plants are annual or perennial. The general habit of the stems suggests that they may be perennial, but the few roots present in the specimens of *Tr. acerifolia* and *Tr. arfakensis* appear not to be torn off from a caudex, and to be annual. The stems are more or less erect, and branched only towards the extremities, forming a leafy di-monochasium of umbels. Basal rosettes are either entirely lacking, as in

Tr. acerifolia, Tr. papillosa and *Tr. adenodes,* or are weekly developed, as is the case in *Tr. arfakensis.*

Tr. rosulans is entirely different from all other species described in this paper. From the roots present in the herbarium specimens, it is not evident whether the plant is annual or perennial. As the root system is weekly developed, one might consider the plant to be annual, but the main stem developing stolones, it may be possible that the plant is perennial.

The genus is chiefly Australian, but outside Australia it is spread to New Caledonia, the Fiji Islands, the Philippines, and, in the area considered in this paper, in New Guinea, Borneo, Selébes, Timor and Flores.

As to the question whether this genus has to be named *Trachymene* or *Didiscus,* I follow NORMAN in Journ. of Bot., 69, p. 287. See also DOMIN, l. c.

Key to the species.

1 Plant glandular-hairy 2
Plant not glandular-hairy 3
2 Ovary hairy. Ripe fruit roughly tuberculate with glandular hairs. Annual, erect, cultivated . . . . **14. T. caerulea**
Ovary glabrous. Ripe fruit smooth. Wild mountain species **11. T. adenodes**
3 Leaves nearly triangular and somewhat hastate in outline, tripartite or ternate with the middle segment longer than the lateral ones **6. T. erodioides**
Leaves never triangular-hastate, more roundish or cuneate in outline, if tripartite or ternate, than the middle segment hardly longer than the lateral ones 4
4 Leaves more long than broad, all of them cuneate to spathulate . . . 5
Leaves more broad than long, sometimes the upper ones cuneate, rarely also the lower ones broadly cuneate 8
5 Leaves coriaceous and stiff, the lamina at least 5 times as long as broad **4. T. rigida**
Leaves not coriaceous and stiff, the lamina at most 3 times as long as broad 6
6 Petiole at least twice as long as the lamina. Prolongated leafy stems absent **2. T. novoguineënsis**
Petiole as long as the lamina or shorter. Leafy stems present . . . 7
7 Peduncles longer than the leaves. Leaves cuneate, in rosettes at the bases of the stem and the branches . . . . **3. T. koebrensis**
Peduncles shorter than the leaves. Leaves subspathulate, not in rosettes, but somewhat crowded towards the extremities of the stems **13. T. rosulans**
8 Stems procumbent. Leaves to 1 cm long and broad, their teeth with apical hairs . . . . **5. T. acrotricha**
Stems erect or adscendent, sometimes caespitose. Leaves more than 1 cm long and broad, their teeth not with apical hairs 9

9 Plants with rosettes at the bases of the stems, sometimes also in the upper leaf axils and at the bases of the branches 10
No rosettes at the base of the stems and the branches, or if small rosettes are present at the base of the stems, these rosettes have disappeared before flowering and the umbels do not form a terminal corymb 12
10 Umbels single from the rosettes, or moreover from the prostrate stems, but never forming a corymbiformous dichasium . . . . **1. T. saniculaefolia**
Umbels forming a corymbiform dichasium on more or less erect stems . 11
11 Calyx teeth at most 0.75 mm long. Leaves more or less divided, but not ternate **7. T. celebica**
Calyx teeth up to 2.5 mm long. Leaves ternate . . . **8. T. Sarasinorum**
12 Leaves to 2 cm long and broad. Surface of stems, sheaths, and petioles densely papillose. Fruit with knob-shaped trichomes . . . . **12. T. papillosa**
Leaves more than 2 cm long and broad. Stems, sheaths and petioles not papillose. Fruit smooth 13
13 Leaves not in rosettes, but more densely placed in the lower thicker portion of the stem, 3-fid to ternate, biserrate with acute teeth **9. T. acerifolia**
Probably small rosettes at the very base of the stem, the latter very slender in its lower portion. Leaves ternate with petiolulate leaflets, the latter serrate with broad, shortly acuminate teeth . . . **10. T. arfakensis**

1. **Trachymene saniculaefolia** STAPF — Perennial herb, with a caudex from which originate rosettes, and, from these rosettes, inflorescences or sympodic leafy stems bearing terminal inflorescences and axillary rosettes, the latter flower-bearing or not. Leafy stems, if present, up to 2 mm thick, terete, striate, more or less hirsute with hairs up to 1 mm long, or glabrous. Leaves with sheats 5—10 mm long, 2—3 mm broad, densely hirsute with hairs up to 2 mm long to glabrous and always ciliate, tapering into the petiole; petiole 3—13 cm long, densely hirsute to glabrous; lamina hirsute on both surfaces to glabrous, very variable as to form and size, roundly-reniformous to broadly cuneate in outline, always broader than long, 0.7—4 cm long, 1—6 cm broad, trifid to tripartite or even ternate, with segments broadly rhomboid or narrower, sometimes divided again, the ultimate segments serrate to lobate in the apical portion. Umbels terminal in the rosettes or on elongated stems opposite to the leaves; peduncle 3—29 cm long, terete, striate, hirsute to glabrous; involucral bracts 7—25 in number, 5—15 mm long, 1—3 mm broad, lanceolate, acuminate, sometimes dentate, glabrous or hirsute, spreading during flowering, appressed later; pedicels 5 to more than 30 in each umbel, the outer ones 5—15 mm long, the inner ones gradually shorter, spreading when flower-bearing, usually incurved when fruit-bearing. Calyx teeth triangular, acute, 0.5—2 mm long, 1—1.5 mm broad at the base, equally developed or one of them larger; petals ovate to lanceolate, 2—2.5 mm long, 0.5—1.5 mm broad; styles 0.5—1.5 mm long. Mericarps

Fig. 1 — *Trachymene* (cf. p. 143, bottom).

1.5—3 mm long, 1—2 mm broad, glabrous, those of the same fruit equally developed; distance between the jugae intermediae and the jugae commissurales 0.5—1 mm; carpophore entire, 4-apiculate, though deeply grooved and sometimes translucent in the middle, only bipartite after weathering.

Trachymene saniculaefolia Stapf, in Hooker, Ic. pl., 24, t. 2308 (1894); in Transact. Linn. Soc., ser. 2, bot., 4, p. 124, 167 (1894); *Didiscus saniculaefolius* Merrill, in Phil. Journ. Sc., bot., 2, p. 255, 256, 292 (1907); Domin, in Sitzungsber. Böhm. Gesellsch. Wissensch., 1908, p. 65 (1908) quoad var.s *typicum, rupicolum, brachystylum*; Merrill, in Ann. Jard. Bot. Buitenzorg, suppl. 3, part 1, p. 283, 287, 288, 293, 302 (1910); Hallier, in Elbert, Sunda-Exp., 2, p. 294 (1912); Gibbs, in Journ. Linn. Soc., bot., 42, p. 39, 43, 47, 85 (1914) cum var.s *typico* et *rupicola*; Wolff, in Engl. & Pr., Nat. Pflanzenfam., Nachtr. 4 (1915) p. 222; Gibbs, Contr. Arfak Mts. (1917) p. 166; Merrill, Bibl. Enum. Born. Pl. (1921) p. 458; Enum. Phil. Fl. Pl., 3, p. 238 (1923); Van Steenis, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934) excl. synon.; an Diels, in Bot. Jahrb., 62, p. 486 (1929)?

Trachymene saniculaefolia is rather variable as to the dimensions of the different parts, the length of the stems, the hairiness, and the shape and incisions of the lamina. Domin describes 4 varieties, *viz.* the var.s *typicus,* and *rupicolus* from Borneo, and the var.s *novoguinensis* and *brachystylus* from New Guinea. The var. *novoguinensis* shows such sharp and constant differences with the typical form, that it appears better to distinguish it as a separate species. The var. *rupicolus,* of which I saw originals in the Kew Herbarium, only differs from the typical form by the smaller dimensions and the dense mode of growth and appears to be a form of high mountain summits. The var. *brachystylus,* of which I likewise saw originals in the Kew Herbarium, entirely agrees with the plants collected by Brass in New Guinea, and is only little different from the var. *typicus* by smaller dimensions. According to Domin, it is an intermediate between his var. *typicus* and his var. *novoguinensis,* and it has the short styles of the latter. As to the leaf-shape this is not correct, and the length of the styles is rather variable as well in *Tr. novoguineënsis* as in *Tr. saniculaefolia,* and appears to have no value for the distinction of these two.

Fig. 1. — *a*: *Trachymene koebrensis,* after Gibbs 5606, $^2/_3$ ×; *b—d*: *Trachymene rigida,* after Lam 1645; *b—c*: flower-bearing stems, $^2/_3$ ×; *d*: mericarp, 4 ×; *e—f*: *Trachymene acrotricha,* after Kjellberg 3884; *e*: plant, $^2/_3$ ×; *f*: mericarp, 4 ×; *g—h*: *Trachymene erodioides,* after Kjellberg 3885; *g*: fruit-bearing stem fragment, $^2/_3$ ×; *h*: mericarp, 4 ×.

It is very remarkable that *Tr. saniculaefolia* proves to occur in Australia. The Australian plants agree very well with those collected on Mt. Kinabalu in Borneo.

PHILIPPINE ISLANDS. Mindoro, Mt. Halcon, MERRILL 6174 (BD, K, L).

BORNEO. Mt. Kinabalu, CLEMENS 30058 (B); 2175 m el., WHITEHEAD s.n. (BM); Temberungo, 2310 m el., HAVILAND 1162 (BM, K, S, Sa), petals white; Kemberanga, CLEMENS 10522, 10538 (B); 2400 m el., open shallow sand, GIBBS 4150 (BM, K); 2100—3300 m el., Marai Parai, above Kamburangan, under great wall, CLEMENS 33164 (B, BM), petals white, organs pinkish, fruit purplish, same colour as stem; 2400 m el., WHITEHEAD s.n. (BM); 2400—3000 m el., Ramburangat to Paka Batra, damp places, GIBBS 4221 (BM, K); 2700 m el., Colombon River basin, on base of wall at falls, CLEMENS 33735 (B, BM); 2100—3300 m el., LOWE s.n. (K); 3000 m el., BURBIDGE s.n. (K); NATIVE COLLECTOR 44 (E, Sa), flower white; 3300—3900 m el., WHITEHEAD s.n. (BM); 3600—3900 m el., granite cap, cracks in granite, GIBBS 4184 (BM); 3900 m el., summit, cracks in granite, GIBBS 4310 (BM); 3900 m el., in crevices of rock right to the top, HAVILAND 1130 (K, S, Sa); 3900 m el., granite cave, HOLTTUM s.n. (S); Paka Cave, CLEMENS 10563 (K); Paka Cave to Low's Peak, CLEMENS 10612 (B, K); Low's Peak, 4020 m el., granite crevices, CLEMENS 27098 (B), fruit reddish purple, Dusan medicine.

NEW GUINEA. S.E. part, Central Division, Wharton Range, Murray Pass, 2840 m el., BRASS 4671 (NY), common amongst grass near forest borders, sometimes as a weed on burnt over ground, indumentum red, petioles, peduncles and fruit red, flowers pink; Mt. Albert Edward, 3680 m el., BRASS 4244 (NY), common, forest glades, whole plant reddish, flowers dark pink; Mt. Scratchley, 3000—3900 m el., GIULIANETTI s.n. (K), originals of *Didiscus saniculifolius* var. *brachystylus* DOMIN.

AUSTRALIA. N. S. Wales, Jenolan Caves, BLAKELY s.n. (BM).

2. **Trachymene novoguineënsis** (DOMIN) BUWALDA, n. sp. — **Fig. 2a.** — Herba perennis, e caudice rosulas proferens vel e caulibus repentibus nonnihil prolongatis iterum rosulas formans. Foliorum vagina ad 2.5 mm longa et 3 mm lata, in petiolum attenuata, margine ciliata pilis ad 2 mm longis; petiolus longitudine variabili, 1—13 cm longus, lamina semper longior, glabra vel laminam versus pilis ad 2 mm longis hirsutus; lamina cuneata, 0.7—3 cm longa, 0.5—1.7 cm lata, triloba vel trifida, segmentis apice dentibus 2 vel 3 latis, nonnihil acuminatis, utrinque glabra vel pilis ad 2 mm longis adpresse hirsuta. Umbellae singulae e rosulis; pedunculus 3.5—37 cm longus, teres, striatus vel subsulcatus, glaber vel pilis ad 1.5 mm longis hirsutus; bracteae involucrantes 7—13, lanceolatae, acutae, 8—12 mm longae, 0.5—1.25 mm latae, glabrae vel margine ciliis nonnullis ad 1 mm longis, tempore florendi patentes, postea adpressae; pedicelli 12—30, florum exteriorum ad 5 mm longi, divergentes, florum interiorum gradatim breviores, post anthesin paulum aucti ad 14 mm longi, incurvati, omnino glabri. Calycis dentes anguste vel late triangulares,

Fig. 2. — a: *Trachymene novoguineënsis*, after PULLE 975, 2/3 ×; b: *Trachymene arfakensis*, after GJELLERUP 1128, 2/3 ×.

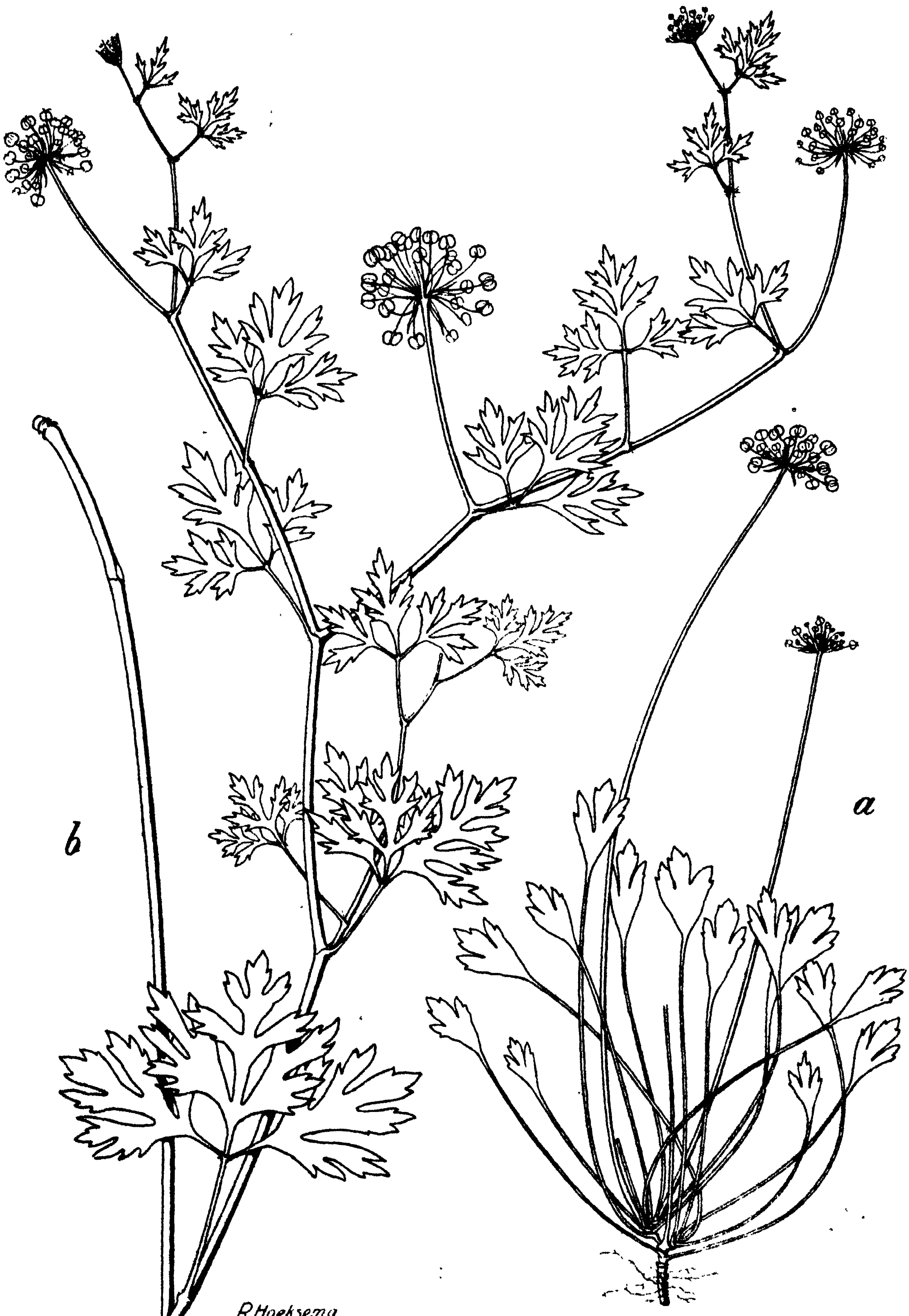

Fig. 2 — *Trachymene* (cf. p. 144, bottom).

0.25—0.5 mm longi, post anthesin paulum aucti; petala elliptica circiter 1.5 mm longa, 0.75 mm lata; styli ad 0.75 mm longi. Mericarpia ad 3 mm longa, 1.5 mm lata, glaberrima, aequaliter evoluta, jugis intermediis circiter 0.75 mm a commissura remota; carpophorum indivisum, 4-apiculatum, utrinque profunde sulcatum, statu vieto tantum bifidum.

Didiscus saniculifolius var. *novoguinensis* DOMIN, in Sitzungsber. Böhm. Gesellsch. Wissensch., 1908, p. 67.

Trachymene novoguineënsis is closely allied to *Tr. saniculaefolia* but differs constantly by cuneate laminae which always are more long than broad. Moreover the peduncles are always remarkably long in proportion to the leaves, it generally has a denser growth, and specimens with prolongated stems bearing rosettes are not known. As to the hairiness, it varies in the same way as *Tr. saniculaefolia.*

Among the materials of the latter from Mt. Kinabalu there are specimens (CLEMENS 10538 and NATIVE COLLECTOR 44) that through broadly cuneate laminae show an approach towards *Tr. novoguineënsis*, but these laminae are always more broad than long and for the rest the specimens are in no way different from typical *Tr. saniculaefolia.* On the other hand *Tr. novoguineënsis* is somewhat like an intermediate between *Tr. saniculaefolia* and *Tr. koebrensis,* but intermediate forms between the three are unknown.

NEW GUINEA. Foot of the Doorman Top, on peaty level ground, 3250 m el., LAM 1586 (B), common from 2900—3300 m el., all green parts exposed to the sunshine tinged with red, corolla light-pink, fruit dark-red on yellowish pedicels; Doorman Top, 3500 m el., steep slope with rock fragments, LAM 1659 (B), green parts exposed to the sunshine somewhat tinged with red, corolla and stamens creamy-white, fruit reddish-yellow; Doorman Top, in marshy ravine with grasses, near to the summit, 3500 m el., LAM 1692 (B), green parts somewhat tinged with red, corolla and stamens white or slightly violet, fruit brown-yellow or tinged with red; S.W. New Guinea, BRANDERHORST (?) 146 (B); Wichmann Mts., 3000 m el., summit, PULLE 975 (B), petioles, peduncles and flowers violet, fruit dark-violet; Hubrecht Valley, 3000 m el., VON RÖMER 1339 (B), fruit-bearing inflorescences only; Mt. Scratchley, 3660 m el., GIULIANETTI s.n. (K), originals of *Didiscus saniculifolius* var. *novoguinensis* DOMIN.

3. **Trachymene koebrensis** (GIBBS) BUWALDA, nov. comb. — **Fig. 1a.** — Perennial herb, entirely glabrous, with a caudex nearly 4 mm thick. Stems prostrate, nearly 2 mm thick at the base, to 40 cm long, bearing leaves over the whole length and rosettes in the leaf axils, densely beset with swollen bases of petioles in the basal part and below the rosettes, forming branches from the axillary rosettes and again forming rosettes in the axils of the leaves. Petiole with sheath 1—2 cm long, always shorter than the lamina; sheath nearly 2 mm long 3 mm broad, tapering

into the petiole; petiole canaliculate above; lamina cuneate, tapering into the petiole, 1—2 cm long, 0.5—1 cm broad below the apex, with 3—5 triangular acute teeth in the apical part, the middle teeth 4—7 mm long, 1.5—3 mm broad, the lateral ones smaller, 1.5—2 mm long, nearly 1 mm broad. Peduncle 6.5—8.5 cm long, terete, striate; involucral bracts 5—7, lanceolate, acute, nearly 6 mm long 0.5 mm broad; pedicels 15—30 in each umbel, the outer ones to 5 mm long, the inner ones shorter, spreading when flower-bearing, somewhat incurved when fruit-bearing. Calyx teeth narrowly triangular or subulate, 0.75—1.5 mm long, to 0.4 mm broad, sometimes somewhat unequally developed; petals obovate, nearly 1.25 mm long, 0.75 mm broad; styles nearly 1.25 mm long. Mericarps to 2.5 mm long, 1.5 mm broad, entirely glabrous; distance between the jugae intermediae and the commissure 0.5—0.75 mm.

Didiscus koebrensis GIBBS, Contr. Arfak Mts. (1917) p. 165.

Tr. koebrensis is somewhat an intermediate between *Tr. novoguineënsis* and *Tr. rigida*; as to the leaves it resembles more *Tr. novoguineënsis,* though the lamina is always longer than the petiole; as to the habit it is more like *Tr. rigida.*

NEW GUINEA. Arfak Mts., Mt. Koebré, abundant in open burnt summit plateau, 2700 m el., GIBBS 5606 (BM, type, K, L), stems spreading.

4. **Trachymene rigida** BUWALDA, n. sp. — **Fig. 1b—d.** — Herba perennis, omnino glabra. Caudex ramosus, rosulas et ex eis saepe caules prolongatos proferens; caules procumbentes, parte inferiore ad 2.5 mm crassi, angulati, sulcati, nodis incrassatis, primum umbellam singulam terminalem ferentes, deinde e nonnullis axillis superioribus rosulas paucifolias et ex eis caules proferentes umbella terminali unica, denique saepe eodem modo iterum ramificans. Folia vagina 1—3 mm longa et lata, utrinque appendicibus nonnullis subulatis rigide coriaceis ad 3 mm longis ciliata; petiolus ad 2 cm longus, 1 mm latus, difficile a lamina distinguendus; folium, petiolo incluso, 2—9 cm longum, lamina 4—7 mm lata, crasse et rigide coriacea, anguste cuneato-spathulata, prope apicem dentibus 1—5 plerumque 3 obtuse triangulis 1—2 mm latis ad 3 mm longis, margine ceterum integro, nonnihil recurvo. Pedunculus 5.5—11 cm longus, 0.5—1.5 mm crassus, angulosus, sulcatus; involucri bracteae 10—12, lanceolatae, 5—10 mm longae, 0.5—1.5 mm latae, acutae vel subobtusae; pedicelli 20 vel plures, 2—4 mm longi, floriferi paulum divaricati, fructiferi erecti. Calycis dentes 0.25—0.75 mm longi obtusi, persistentes; petala oblongo-ovata, 1.5—2 mm longa, 1 mm lata; styli 1.5—2 mm longi. Mericarpia ad 3 mm longa, 2.5 mm lata, aequalia, jugis intermediis 0.5—1 mm a commissura remotis.

Didiscus odontocoleus BUWALDA, ex VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934), nomen.

Trachymene rigida differs from all other *Trachymene* species known, through its narrowly cuneiformous, thickly coriaceous leaves, but, as to its mode of growth, it entirely agrees with *Tr. koebrensis* and even with *Tr. saniculaefolia.* Its peculiar leaf-shape is connected with that of *Tr. saniculaefolia* by that of *Tr. koebrensis* and of *Tr. novoguineënsis.*

NEW GUINEA. Doorman Top, open slope between rocks, LAM 1645 (B), all parts exposed to the sunshine tinged with dark violet, corolla white inside, filaments pale green, anthers lilac, fruit dark-violet or brownish.

5. **Trachymene acrotricha** BUWALDA, n. sp. — **Fig. 1e—f.** — Herba perennis. Caudex ad 3 cm longus et 3 mm crassus, apicem versus rudimentis foliorum incrassatis dense vestitus. Caules ad 13 cm longi, basi circiter 2 mm crassi, prostrati, sulcati, parte inferiore glabri, parte superiore pilis divaricatis ad 1.5 mm longis in costis insertis densiuscule hirsuti. Folia sparsa (rosulae desunt); vagina ad 4 mm longa 2 mm lata, in petolium attenuata, margine pilis ad 3 mm longis ciliata; petiolus ad 7 mm longus, canaliculatus, pilis ad 2 mm longis dense hirsutus; lamina foliorum inferiorum circuitu reniformia, foliorum superiorum late rhomboidea, circiter 7 mm longa 10—15 mm lata, tripartita vel trifida, segmentis cuneatis parte apicali dentibus latis omnibus in pilum apicalem exeuntibus, subcoriacea, statu sicco involuta, palminervia, facie superiore glabra, inferiore nervis pilis 1—2 mm longis sparse hirsuta. Umbellae in parte superiore caulium foliis oppositae; pedunculus 0.5—2 cm longus, teres, incurvatus, pilis ad 1.5 mm longis dense hirsutus; bracteae involucrantes 8—10, lanceolatae acutae, 4 mm longae, circiter 1 mm latae, canaliculatae, glaberrimae, margine dentatae, dentibus et apice pilo terminali ornatae; pedicelli 10—22, exteriores ad 4 mm longi, interiores breviores, glaberrimae, apice nonnihil dilatatae. Calycis dentes 0.5—1 mm longi, basi 1 mm lati, triangulares acuti; petala elliptica, circiter 1.5 mm longa, 1 mm lata, apiculata; styli ad 0.75 mm longi. Mericarpia 2.25—3 mm longa, 1.5—2 mm lata, glaberrima, jugis indistinctis, carinalibus paulo distinctioribus quam suturalibus, intermediis 0.5—0.75 mm a commissura remotis; carpophorum 1.5 mm longum, filiforme, biapiculatum.

A peculiar small plant from stony localities on high mountain tops, agreeing with the foregoing species, especially *Tr. koebrensis,* by the mode of growth of its stems, but entirely different as to the shape of the leaves and the peculiar hairs on the tips of the leaf teeth.

SELEBES. B. Bante Mario, on mountain heath, 3100 m el., KJELLBERG 3884 (B), flowers white, plant reddish.

6. **Trachymene erodioides** BUWALDA, n. sp. — **Fig. 1g—h.** — Herba, ex fragmentis notis parva. Caules repentes, 0.5—1 mm crassi, teretes, nodis nonnihil incrassatis rudimenta foliorum incrassata ferentibus, pilis 1—2 mm longis magis vel minus hirsuti (probabiliter ramosi more specierum praecedentium). Folia singula et in rosulis paucifoliis axillaribus disposita; vagina c. 2 mm longa 1 mm lata, sensim in petiolum attenuata, extus dense pilosa, basi pilis ad 5 mm longis, dorso et margine pilis 1—3 mm longis; petiolus 1.5—4 cm longus, canaliculatus, pilosus, pilis 1—2 mm longis crispatulis divaricatis; lamina 1.5—2.5 cm longa, 1—2 mm lata, circuitu ovato-triangularis nonnihil hastata, utrinque parce pilosa pilis 1—2 mm longis crispulis, tripartita vel ternata, segmento terminali triangulari-rhomboideo, 1—2 cm longo, 0.5—1.5 cm lato, lateralibus 5—12 mm longis 5—7 mm latis, ovatis, omnibus basin versus pennatifidis, apicem versus crenatis, apicibus omnibus brevissime acuminatis. Umbellae terminales vel formatione rosularum axillarium laterales; pedunculus adscendens, 2.5—3.5 cm longus, tenuis, teres, striatus, densiuscule pilosus, pilis crispulis 1—2 mm longis; bracteae involucrantes 5—6, lanceolatae, 3—5 mm longae, glabrae vel parce ciliatae; pedicelli 12—15, exteriores ad 7 mm longi, interiores breviores, glaberrimi. Flores desunt; calycis dentes (in fructu) subnulli vel parvi ad 0.25 mm longi; styli c. 0.5 mm longi. Mericarpia 2.5—3 mm longa, c. 2 mm lata, glaberrima, aequalia vel subaequalia, jugis intermediis c. 0.75 mm a commissura remotis.

Didiscus erodioides BUWALDA, ex VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934) nomen.

This peculiar new species is only known from rather small detached fruit-bearing stem fragments, but is entirely different from all other species of the genus by the peculiar leaf-shape. In mode of growth it probably agrees with the preceding species.

SELEBES. B. Poka Pindjang, mountain heath, 2700 m el., KJELLBERG 3885 (B), rare.

7. **Trachymene celebica** HEMSLEY — Perennial herb, with a caudex terminated by rosettes, from which originate erect flower-bearing stems and lateral rosettes either sessile, or on short stolones originating from the upper axils. Stems terminal in the rosettes (seemingly lateral when the rosette is dying off and new lateral rosettes have developed from it) erect or ascending, 20—50 cm high, nearly terete, more or less ribbed, 3—5 mm thick in the lower portion, more or less densely hirsute with 2—3 mm long spreading hairs, little-branched and few-leaved in the lower portion, not bearing rosettes in the axils, but terminated by a corymbiformous inflorescence of umbels. Rosette leaves with sheats 1—

2 cm long, 7—13 mm broad, glabrous outside in the basal portion, hirsute like the stem towards the apex, ciliate in the upper portion with 2—4 mm long hairs; petioles 5—15 cm long, hirsute like the stems; laminae roundish in outline, deeply cordate, 5—13 cm long, 7—14 cm broad, 3—7-palmatifid with obovate, 3-lobed, moreover biserrate, segments, more or less densely hirsute on both sides with nearly 1 mm long hairs; cauline leaves and bracts of the inflorescence gradually smaller and shorter-petioled, the uppermost ones nearly sessile, with less numerous and narrower segments and smaller sheaths. Umbels placed in a terminal corymbiformous dichasium of umbels; lower peduncles 2.5—6 cm long, upper ones gradually shorter, all of them angular, grooved, hirsute like the stems. Involucral bracts numerous, narrowly lanceolate, nearly 10 mm long, 1 mm broad, long-acuminate, with 0.5—1.5 mm long hairs at the margin and on the midrib, appressed to the pedicels. Flowers numerous (more than 50) in each umbel, the outer ones not fruiting; pedicels spreading when flower-bearing, incurved when fruit-bearing, the outer ones to 17 mm long, the inner ones gradually shorter. Calyx teeth acute, small; petals elliptic, acute, nearly 2.5 mm long, 1.5 mm broad; styles nearly 3 mm long. Mericarps nearly 4 mm long, 3 mm broad, with persistent calyx teeth and styles, the jugae intermedia 0.5—1.25 mm remote from the commissure; carpophore entire.

Trachymene celebica HEMSLEY, in Kew Bull., 1896, p. 37; in HOOKER, Ic. pl., 25, t. 2487 (1896); *Didiscus celebicus* SARASIN, Reisen in Celebes, 2 (1905) p. 337; DOMIN, in Sitzungsber. Böhm. Gesellsch. Wissensch. (1908) p. 68; WOLFF, in ENGL. & PR., Natürlich. Pflanzenfam., Nachtr. 4 (1915) p. 222; GIBBS, Contr. Arfak Mts. (1917) p. 166; VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934); *Didiscus buginensis* WOLFF, in FEDDE, Repert., 17, p. 439 (1921).

This species, mainly known from one mountain summit, it little polymorphic. The form described by WOLFF as *Didiscus buginensis*, from another mountain, is different by its being less hairy in all parts and by the more acute leaf-segments, but these differences certainly are insufficient for specific distinction in this genus.

SELEBES. S.W. peninsula, Bowolangi, SARASIN 2155 (BD, type of *Didiscus buginensis* WOLFF); G. Bantaèng (= G. Lompobatang), N.W. slope, 2300 m el., BÜNNEMEIJER 11898 (B, BD, L, S, U), flowers white, fruit red, stems red near the base, the roots are eaten raw as a medicament against stomach-ache, v.n.: *kriongo edja*; 2600 m el., BÜNNEMEIJER 12170 (B, L), petioles red, flowers white, fruit red; 3000 m el., EVERETT 73 (S), 74 (S, K, type of *Trachymene celebica* HEMSLEY); 2700 m and higher, in crevices of rocks, SARASIN 1276 (BD), flowers white, stems and indumentum beautifully crimson, gathered by the natives for medicinal purposes;

Gowa, near top, 2700—2850 m el., VAN ZIJLL DE JONG 10 (B), v.n.: *djahé mérah*, stony, steep locality, bare volcanic rocks, rather common, flowers white, leaves green, petioles bright red.

8. **Trachymene Sarasinorum** (WOLFF) BUWALDA, nov. comb. — Mode of growth as in the preceding species. Stems erect, 30—40 cm high, terete, striate, sparingly hirsute, more densely at the nodes. Leaves nearly all in a rosette; sheats 3—6 mm long, 5—8 mm broad, with 1—2 mm long hairs on the back and at the margin, abruptly contracted into the petiole; petiole 6—8 cm long, hirsute with 1—2 mm long hairs, more densely hirsute towards the lamina; lamina roundish in outline, deeply cordate, 4—4.5 cm long, 6—7 cm broad, ternate, the middle leaflet rhomboid nearly 4 cm long, 3.5 cm broad, 3-partite with 2—3-lobed coarsely serrate segments, the lateral leaflets hardly smaller, obliquely trifid with 2—3-lobed, coarsely serrate segments, the whole lamina rather sparingly appressedly hirsute on both sides; cauline leaves smaller, shorter-petioled, the bracts of the dichasium nearly sessile. Peduncles of the umbels 3—4 cm long, terete, striate, shortly hirsute; involucral bracts numerous, 7—10 mm long, nearly 0.5 mm broad, narrowly lanceolate, acuminate, with few nearly 1 mm long hairs at the margins and on the midrib, spreading during flowering, appressed later; pedicels 7—11 mm long, nearly glabrous, spreading, somewhat erect when fruitbearing. Calyx teeth nearly 2.5 mm long, subulate; petals ovate, 2—2.5 mm long, 1 mm broad; styles nearly 2 mm long. Mericarps nearly 4.5 mm long, 3.5 mm broad, entirely glabrous, usually equally developed or one somewhat smaller; carpophore entire.

Didiscus Sarasinorum WOLFF, in FEDDE, Repert., 17, p. 440 (1921); VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934).

Trachymene Sarasinorum shows one important difference with *Tr. celebica*, *viz.* the long, nearly filiformous calyx teeth. For the rest it differs so little from it, that it could hardly be distinguished as a variety. The more acute leaf segments also occur in the specimen described by WOLFF as *Didiscus buginensis*, which is reckoned to *Tr. celebica* here.

SELEBES. Southern Peninsula, Piek van Maros (not „Pickumhardt"), 1100 m el., SARASIN 1122 (BD, type), flower white, the plant had to be killed with hot water before it could be dried, like Orchidaceae, Liliaceae, &c.

9. **Trachymene acerifolia** NORMAN — **Fig. 3.** — Stem herbaceous, 20—45 cm high, erect and terete in the lower portion, 3—8 mm thick near the base, terete or somewhat angular and gradually less thick upward, with spreading branches in the upper portion, the branches with inflorescences opposite to the leaves, all densely velvety hairy with

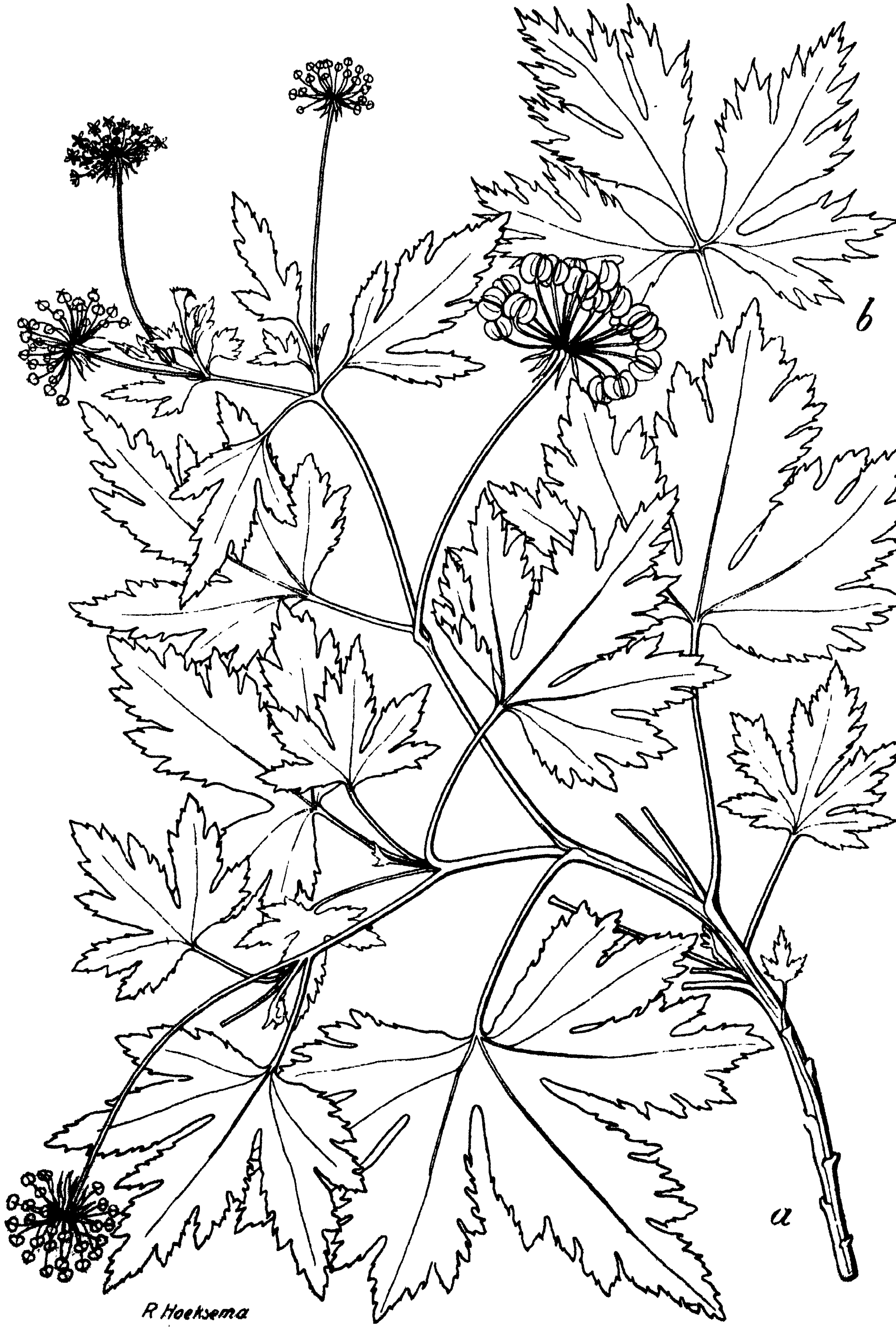

Fig. 3 — *Trachymene acerifolia* (cf. p. 153, bottom).

yellowish-brown indumentum to glabrous in the young state, glabrescent later. Leaves more or less hirsute to glabrous on both sides, rather densely placed in the lower portion of the main stem (but not forming rosettes) with distances of less than 1 cm, more remote in the upper part and along the branches; petioles of the lower leaves longer than the lamina, to 13.5 cm long, those of the upper leaves gradually shorter, those of the uppermost leaves nearly none, all of them slightly sheaty at the base, hairy like the stem; lamina palmatifid to ternate, with 3—5 rhomboid to obovate segments, the middle of which is 3-lobate to 3-fid, all of them moreover biserrate with acuminate teeth; lamina of the upper leaves smaller and more cuneate at the base. Umbels opposite to the leaves; peduncles 1—5 cm long when flowering, up to 7 cm long afterwards, terete, grooved, hairy like the stem; involucre with 7—10 bracts, shorter than or as long as the pedicels, lanceolate, up to 3 mm broad, hairy like the leaves; pedicels 25—40 in each umbel, spreading, the outer ones up to 7 mm long when flower-bearing, up to 15 mm long when fruit-bearing, the inner ones somewhat shorter. Calyx teeth to 0.5 mm long, acute or obtuse; petals elliptical, to 2 mm long and nearly 1 mm broad, acute; styles nearly 0.5 mm long in the flower, up to 1.5 mm long on the fruit. Mericarps to 6 mm long, 4 mm broad, equally developed, the distance between the jugae intermediae and the commissure 1.5—2 mm; carpophore entire or shortly bifid at the tip. (Description after the Timor and Flores plants).

Trachymene acerifolia Norman, in Journ. Bot., 69, p. 287 (1931); *Didiscus acerifolia* Van Steenis, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 255 (1934), p. 404 (1935).

This species has been based on specimens collected by Mrs. Walsh on Mt. Moetis, in Timor, and preserved in the herbarium of the British Museum. Other specimens of the same number extant in the Buitenzorg herbarium, and plants collected later by De Voogd on the same mountain, entirely agree with the type specimens. A somewhat different form has been collected later in the island of Flores; it differs in the very scarce indumentum and the thinner and deeper-divided ternate leaves. As there is, in my opinion, no doubt wether this form belongs to the same species, the above description has been made after all the Timor and Flores materials.

The specimens from Selébes, mentioned below, are more different

Fig. 3. — *Trachymene acerifolia*; *a*: stem of Walsh 345; *b*: leaf of Posthumus 3236, both $^2/_3$ ×.

and do not belong with certainty to the same species, but the materials extant are too imperfect to base a new species upon them. They have stronger developed leaf sheats, and involucres composed of broader bracts and enclosing the flowers in the young state. The number HEINRICH 265 has thin, nearly glabrous leaves, cuneate to truncate at the base, the peduncles to 2.5 cm long, shorter than the petioles, and the flowers probably purple; it is indicated on the label as a shrub, semi-liane. The number KJELLBERG 3886 has the leaves deeply cordate, thicker, and sparsely hairy, the peduncles to 5 cm long, longer than the petioles, the flowers pink; it is indicated on the label as a shrub. Both specimens are detached extremities of flowering stems.

TIMOR. Goenoeng Moetis, summit, 2365 m el., WALSH 345 (B, BM, type), in one locality only, flowers cream coloured; G. Moetis, 2000 m el., DE VOOGD 2300 (B), very common.

FLORES. Goenoeng Kasteno, N.W. slope at 1800 m el., in primary forest, POSTHUMUS 3236 (B).

SELEBES. S.E. part, Mengkoka Mts., 2000 m el., HEINRICH 265 (BD), shrub; B. Poka Pindjang, 2600 m el., KJELLBERG 3886 (B), in damp valley, rare, shrub nearly 1 m high, semi-liane, flower pink.

10. **Trachymene arfakensis** (GIBBS) BUWALDA, nov. comb. — **Fig. 2b.** — Stems herbaceous, more or less erect, glabrous, long and slender, to 50 cm long, 3—6 mm thick and showing scars and remnants of leaf-sheats (of rosette leaves?) at the thickened base, unbranched and nearly 3 mm thick in the lower portion, terete, striate to slightly sulcate, several times dichotomously branched in the upper portion, the branches spreading and sympodic, their nodes alternately with and without umbel opposite to the leaf. Leaf sheats 2—7 mm long, 1.5—4 mm broad, tapering into the petiole, ciliate with hairs up to 2 mm long; petioles 2—7 cm long in the lower leaves, gradually shorter in the upper ones, canaliculate, glabrous or with few hairs up to 2 mm long towards the lamina; lamina roundish-cordate in outline, 2.5—7 cm long by 4—8 cm broad in the lower leaves, gradually smaller in the upper leaves, ternate, the leaflets with petiolules to 1.5 cm long, 2—3-fid to 2—3-partite, the segments 3-lobed and coarsely serrate, the teeth slightly acuminate and apiculate, the upper surface nearly glabrous, the lower surface sparingly hirsute, especially on the nerves, the base ciliate with hairs up to 2 mm long. Umbels opposite to each other leaf; peduncles 1.2—7 cm long, terete to sulcate; involucral bracts 5—10 in number, 5—10 mm long, linear to filiformous, the broadest ones with few filiformous teeth; pedicels 20—30 in number, the outer ones 5—8 mm long when flower-bearing, 10—15 mm long when fruit-bearing, spreading, the inner ones shorter. Calyx teeth

hardly any; petals 1—1.5 mm long, 0.75—1 m broad, ovate, acute; styles 1—1.5 mm long. Mericarps up to 5 mm long, 3 mm broad; carpophore entire, biapiculate with blunt tips; distance between the jugae intermediae and the commissure 0.5—1.5 mm.

Didiscus arfakensis GIBBS, Contrib. Arfak Mts. (1917) p. 166; VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934).

This species is closely allied to *Tr. acerifolia,* but is different by its being more slender and smaller in all parts, *e. g.* by smaller flowers and fruit, by the main stem not bearing densely placed leaves in its lower portion, but perhaps bearing real rosettes at its base, by umbels not opposite to each leaf but to each other leaf of the branches, and by ternate leaves with petiolulate leaflets. Ternate leaves are also found in the Flores variety of *Tr. acerifolia*, but here the leaflets are not distinctly petiolulate and the teeth are longer and more acute.

SELEBES. Bohaa Mts., 1500—1700 m el., SARASIN 2072 (BD), herbaceous, to 2 m high, flowers white.

NEW GUINEA. Arfak Mts., S.W. ridge, Angi Lake, open spaces, 2400 m el., GIBBS 5513 (BM, type); near Angi Lake, 1900 m el., marshy banks, on muddy granite soil, GJELLERUP 1087 (B), herb, 0.75 m high, flowers white, stems brownish, leaves dull-green; ibidem, in peaty places of the bank, dry places in muddy humus on granite soil, GJELLERUP 1128 (B), herb, 0.5 m high, in groups, stems green with reddish hue especially at the nodes, flowers white.

11. **Trachymene adenodes** BUWALDA, n. sp. — **Fig. 4a—b.** — Caules herbacei, teretes, striati, ad 42 cm longi et ultra, parte inferiore adscendentes, simplices, 4 mm crassi, glabri, parte superiore ramosi ramis primum dichotomis deinde sympodicis, pilis ad 2 mm longis subdense hirsutis. Folia in caulis parte inferiore 0.3—1 cm, ceterum magis distantia; vagina 5—8 mm longa, 3—5 mm lata, semiamplexicaulis, sensim in petiolum attenuata, glabra, margine ciliis ad 3 mm longis, partim glanduliferis; petioli foliorum inferiorum quam lamina longiores, 7—17.5 cm longi, superiorum gradatim breviores, summorum subnulli, parte inferiore parce pilosi, versus laminam densius hirsuti pilis glanduliferis ad 3 mm longis; lamina foliorum inferiorum ad 4.5 cm longa, ad 6 cm lata, circuitu rotundato-cordata vel subreniformis, 3—5-partita segmentis rhomboido-ovatis, medio trifido partibus 2—3-lobis, omnibus apicem versus serratis dentibus latis nonnihil acuminatis subapiculatis, utrinque parce pilosa pilis adpressis ad 2 mm longis passim glanduliferis, margine praesertim in incisionibus ciliis ad 2 mm longis. Umbellae foliis oppositae et in bifurcationibus; pedunculi inferiores ad 10 cm longi, superiores breviores, omnes apicem versus pilis glanduliferis ad 1 mm longis hirsuti; involucrum ante anthesin floribus longius, alabastra in-

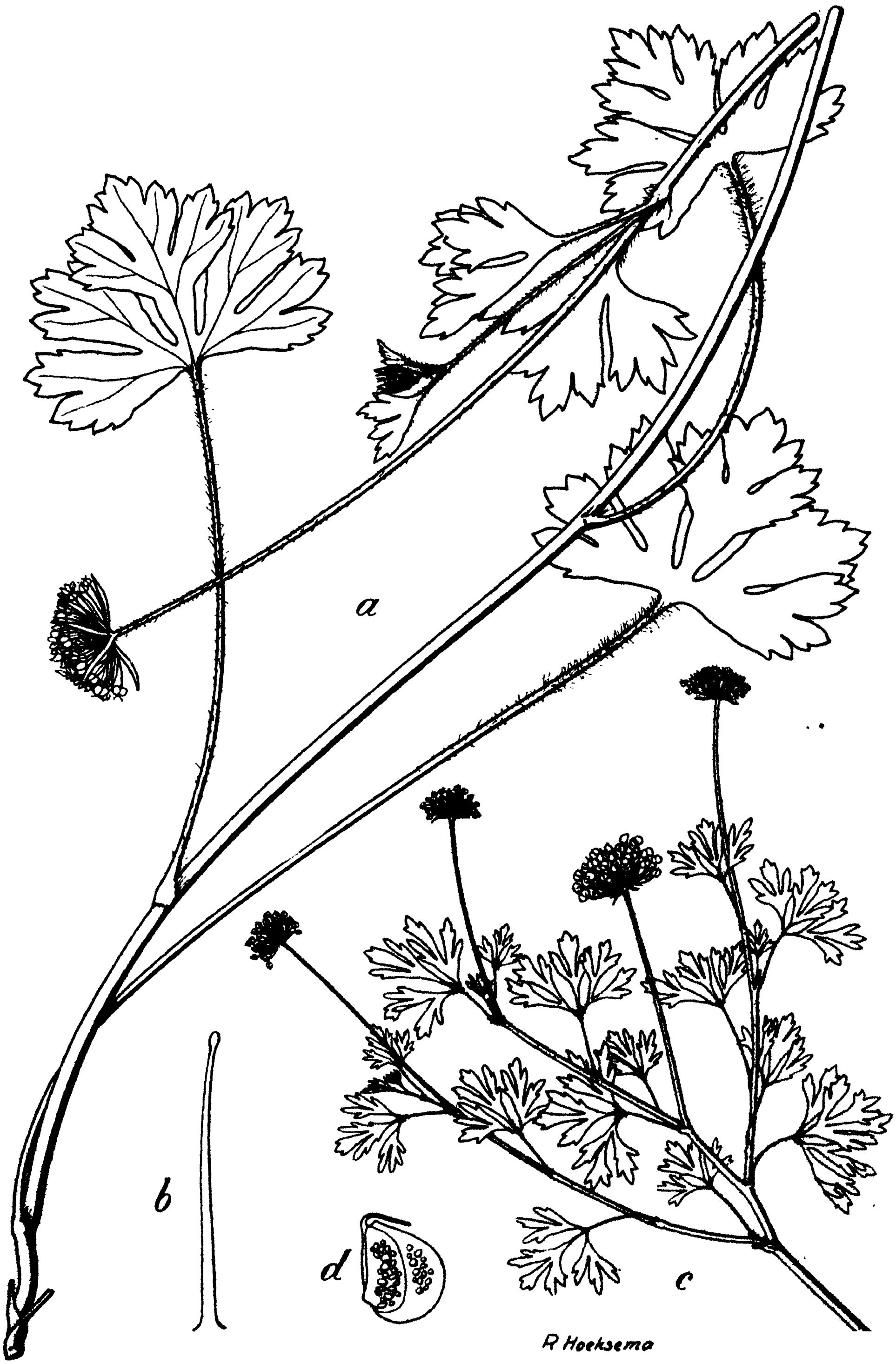

Fig. 4 — *Trachymene* (cf. p. 157, bottom).

cludens, bracteis 6—8 lanceolatis acutis 7—10 mm longis, 1—1.5 mm latis, glabris, pilis ad 1.5 mm longis ciliatis; pedicelli circiter 30, exteriores 7—9 mm longi, interiores breviores, glaberrimi. Calycis dentes c. 0.25 mm longi, late triangulares; petala obovata, circiter 1.5—2 mm longa, 1—1.5 mm lata; styli c. 1.5 mm longi. Fructus maturi desunt, submaturi ad 2 mm longi 3.25 mm lati, glaberrimi, jugis intermediis a commissura circiter 0.5 mm distantibus.

In general appearance this new species comes near to *Tr. arfakensis*, but it is more robust and also resembles *Tr. acerifolia*. From both it differs by its glandular indumentum of the petioles, stems, and peduncles.

NEW GUINEA. N.E. part, Saruwaged Mts., Bolan, 2400—3000 m el., KEYSSER s.n. (BM).

12. Trachymene papillosa BUWALDA, n. sp. — **Fig. 4c—d.** — Caules herbacei, probabiliter adscendentes, 20—40 cm longi, simplices vel in parte superiore ramosi, teretes, dense papillosi et superea pilis rigidis circiter 1 mm longis hirsuti. Folia sparsa (rosulae desunt); vagina 2—3 mm longa, 2 mm lata, semiamplexicaulis, in petiolum attenuata, papillosa ut caulis, superea ciliata pilis 1—2 mm longis; petiolus 0.5—2.5 cm longus, hirsutus et papillosus ut caulis; lamina circuitu orbiculari-reniformis, 1—2 cm longa, c. 3 cm lata, ternata, foliolis rhomboideis 1—2 cm longis 1—1.5 cm latis, basi valde attenuatis, 2—3-fidis vel 2—3-partitis, segmentis terminalibus saepe biserratis, versus basin papillosis, sparse hirsutis utrinque. Umbellae terminales ad apices caulium et ramorum, saepe foliis oppositae; pedunculus 3—6 cm longus, teres, striatus, hirsutus papillosusque ut caulis; bracteae involucrantes 6—12, lineari-lanceolatae, acutae, 4—5 mm longae, 0.5—1 mm latae, glabrae, pilis nonnullis ad 1.5 mm longis ciliatae; pedicelli 30—50, exteriores ad 5 mm longi, interiores breviores, glabri levesque, floriferi divaricati, fructiferi magis erecti. Calycis dentes 0.25—0.5 mm longi latique, triangulares, aequales; petala ovata, acuta, c. 1.5 mm longa; ovarium squamulis minimis; styli 1—1.5 mm longi. Mericarpia atra, ad 2 mm longa, ad 2 mm lata, aequalia, jugis intermediis 0.5—0.75 mm a commissura remotis, trichomatibus tuberculiformibus ornata, praesertim inter jugas intermedias et commissuram; carpophorum integrum, vix biapiculatum.

Didiscus scabriusculus BUWALDA, ex VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 255 (1934) nomen.

Fig. 4. — *a—b*: *Trachymene adenodes*, after KEYSSER s.n. (BM); *a*: flowering stem, $^2/_3$ ×; *b*: glandular hair of the petiole, 16 ×; *c—d*: *Trachymene papillosa*, after VERSTEEG 1221; *c*: branched upper portion of a stem, $^2/_3$ ×; *d*: mericarp, 4 ×.

This new species comes nearest to *Tr. arfakensis* by its mode of growth, but is different by its smaller dimensions, the papillose surface of its stems, sheaths and petioles, and the peculiar knob-shaped trichomes on the ripe fruit.

NEW GUINEA. S.W. part, probably Hellwig Mts., VERSTEEG 1221 (B, type), herb, flowers reddish-white; near Waterval Bivouac, 3300—3500 m el., VAN NOUHUYS 24 (U).

13. **Trachymene rosulans** (DANSER) BUWALDA — Perennial (or annual?) herb. Primary root fusiformous, branched. Main stem erect, to 13 cm long, to 2.5 mm thick at the base, almost covered with the thickened bases of leaf-sheaths in the lower portion, producing branches from the basal part, that are procumbent or adscendent, with scale-like leaves, to 14 cm long, and other branches from the upper portion that are like the upper portion of the main stem, the whole plant forming a semi-globose whole. Leaves scattered, more densely placed towards the extremities of the stems, somewhat forming terminal rosettes; sheath 2—12 mm long, to 3 mm broad, with a membranous margin, tapering into the lamina; lamina 8—18 mm long, 3—9 mm broad, spathulate, with 3 acute or obtuse teeth in the apical portion, the middle tooth to 2 mm long and 2.5 mm broad, the lateral teeth to 1 mm long and broad. Umbels opposite to the leaves; peduncle 5—12 mm long, terete, striate; involucral bracts 8—12 in number, lanceolate, 6—9 mm long, to 1.5 mm broad; pedicels 10—20 in number, the outer ones 4—7 mm long, the inner ones shorter, hardly longer after flowering. Calyx teeth to 0.75 mm long, triangular, acute; petals roundish-elliptical, nearly 1.5 mm long, 1 mm broad; styles nearly 1.25 mm long. Mericarps to 3.5 mm long, to 3 mm broad, entirely glabrous, the distance from the jugae intermediae to the commissure 0.75—1.25 mm; carpophore entire, bi-apiculate, 2—2.5 mm long.

Didiscus rosulans DANSER, in Brittonia, II, 2 (1936) p. 135, cum icone.

In the mode of growth this species is entirely different from all species of the genus described in this paper.

NEW GUINEA. S.E. part, Wharton Range, Murray Pass, burnt fringes of forest, BRASS 4513 (NY, L, type), common, leaves pale, fleshy, flowers pink; ibidem, grasslands, 2840 m el., BRASS 4177 (NY), common, leaves smooth and shining, pale green, flowers pale pink.

14. **Trachymene caerulea** (HOOKER) GRAHAM — Annual herb, erect, pilose and glandulose in nearly all parts. Primary root fusiformous, with fibrous branches. Stem single, erect, unbranched in the lower portion, with branches in the upper portion usually simple and not overtopping the main stem. Lower leaves petioled, the petiole 1.5—4 cm long, hardly

sheathy, the lamina roundish in outline, ternate, with bipennatifid to bipennatipartite leaflets, with narrow segments and subacute to subobtuse apiculate tips; upper leaves sessile or subsessile, less divided, the uppermost ones with only 3 narrow segments. Umbels terminal to the main stem and its branches, many-flowered; involucral bracts numerous, linear, nearly filiformous towards the tip, nearly as long as the flowers; pedicels of the outermost flowers 10—25 mm long, the interior gradually shorter, the innermost ones very short, spreading when flower-bearing, more erect later. Outermost flowers larger than the other ones, not fruit-bearing, probably male; calyx teeth subulate, very short; petals ovate to obovate, 2.75—3 mm long, 2—2.25 mm broad, shortly unguiculate at the base, with short glandular hairs at the outside; styles nearly 1 mm long; ovary glandular-hairy. Mericarps 3.25 mm long, up to 2.75 mm broad, roughly tuberculate with glandular hairs; distance between the jugae intermediae and the commissure 0.5 mm. (Description after Australian materials in the Leiden Herbarium.)

Didiscus caeruleus HOOKER, in Curt. Bot. Mag., 55, t. 2875 (1828); D. C., Prodr., 4 (1830) p. 72; DOMIN, in Sitzungsber. Böhm. Gesellsch. Wissensch. (1908) p. 43; WOLFF, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 222 (1915); *Trachymene caerulea* GRAHAM, in Edinb. New Phil. Journ., 5, p. 380 (1828); BENTHAM, Fl. austr., 3 (1866) p. 349; *Didiscus cyaneus* D. C., Mém. Ombellif. (1829) p. 28; *Huegelia caerulea* REICHENB., Iconogr. exot., t. 20 (1829).

JAVA. Pasoeroean, cultivated in gardens, BACKER s.n. (Pa).

Distribution: Australia.

IV. SANICULA

LINN., Sp. pl., ed. 1 (1753) 1, p. 235; Gen. pl., ed. 5 (1754) p. 109; BENTH. & HOOK.F., Gen. pl., 1, p. 880 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 670 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 615; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 137 (1898); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 61 (1913) p. 48; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 957 (1925).

Only species:

1. Sanicula europaea LINN. — Perennial herb with more or less creeping rhizomes. Stems 15—75 cm high, slender, deeply grooved, glabrous or rarely, like the whole plant, hairy. Lower leaves with a petiole 3—20 cm long, and a tripartite to ternate lamina with incised moreover serrate-crenulate segments, the teeth mucronulate. Umbels in

a dichasium terminating in monochasia, sessile or on peduncles up to 1.5 cm long, and with 5—8-leaved involucre, 4—6-flowered, with 2—3 outer male flowers on pedicels 0.5—1 mm long and 2—4 female flowers sessile or on pedicels up to 0.5 mm long. Calyx teeth distinct 1—1.5 mm long, 0.25 mm broad, oblong, acute; petals nearly 1.25 mm long, 0.5 mm broad, with exception of the inflexed tip. Mericarps nearly 2 mm long, 1 mm broad, densely covered with about 1.5 mm long uncinate bristles.

Sanicula europaea LINN., Sp. pl., ed. 1 (1753) 1, p. 235; D. C. Prodr., 4 (1830) p. 84; THWAITES, Enum. pl. Zeyl. (1859) p. 130; HIERN, in Fl. Trop. Afr., 3 (1871) p. 8; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 670 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 616; TRIMEN, Handb. Fl. Ceyl., 2 (1894) p. 276; DRUDE, in ENGL. & PR., Nat. Pflanzenfam. III, 8, p. 137, ic. 56A (1898); KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228, p. 97 (1911); HALLIER, in Meded. Rijks Herb. Leiden, 12 (1912) p. 11; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 724; WOLFF, in ENGLER, Pflanzenr., IV, 228, Heft 61 (1913) p. 61; RANT, in Trop. Nat., 3 (1914) p. 2; WOLFF, in ENGL. & PR., Nat. Pflanzenfam., Nachtr. 4 (1915) p. 224; BOLDINGH, Zakfl. Landbouwstr. Java (1916) p. 174; MERRILL, Bibl. Enum. Born. Pl. (1921) p. 458; RIDLEY, Fl. Mal. Pen., 1 (1922) p. 871; in Journ. Mal. Br. Roy. As. Soc., 1, p. 63 (1923); KOORDERS, Fl. Tjibodas, 2, p. 232 (1923); DOCTERS VAN LEEUWEN, in Flora, 118—119, p. 84 (1925); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 957, ic. 2329, t. 191, fig. 1 (1925); SENN, in Journ. Manch. Geogr. Soc., 41—42 (1925—1926) p. 4; SCHMUCKER, in Beih. Bot. Centralbl., 43, 2, p. 51, 66 (1927); DOCTERS VAN LEEUWEN, in Trop. Nat., 16 (1927) p. 118, ic. 26; 17 (1928) p. 104, 172; SCHRÖTER & BACKER, in Festschr. Hans Schinz (1928) p. 595; DE VOOGD, in Trop. Nat., 18 (1929) p. 194; RANT, in Nat. Tijdschr. Ned. Ind., 89, p. 451 (1929); VAN STEENIS, in Trop. Nat., 19 (1930) p. 89; DOCTERS VAN LEEUWEN, in Bull. Jard. Bot. Buitenzorg, sér. III, 11, p. 35, 49 (1930); DAKKUS, in Bull. Jard. Bot. Buitenzorg, sér. III, suppl. 1 (1930) p. 258; RIDLEY, Dispers. Pl. (1930) p. 591; DOCTERS VAN LEEUWEN, in Verh. Akad. Wetensch. Amsterdam, afd. Natuurk., sect. 2, XXXI (1933) p. 13, 17, 52, 68, 87, 124, 138, 196, 197, 218, ic. 41, tab. 18; FREY-WYSSLING, in Trop. Nat., 22 (1933) p. 5; VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 15, 16, 50 (1933), p. 256 (1934); *Sanicula elata* D. DON, Prodr. Fl. Nep. (1825) p. 183; D. C., Prodr., 4 (1830) p. 85; WIGHT & ARN., Prodr. Fl. Pen. Ind. Or. (1834) p. 367; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 40; BECCARI, Malesia, 1 (1877) p. 219; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 137 (1898); CHERMEZON, in LECOMTE, Fl. Indo-Ch., 2, p. 1141

(1923); *Sanicula javanica* BLUME, Bijdr. Fl. Ned. Ind., 15 (1826) p. 882; D. C., Prodr., 4 (1830) p. 85; HASSKARL, Cat. Pl. Hort. Bot. Bogor. (1844) p. 163; ZOLL. & MOR., in MORITZI, Syst. Verz. 1842—1844 (1846) p. 41; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 137 (1898); RIDLEY, in Journ. F. M. S. Museums, VIII, 4 (1917) p. 41; BAKER, in Journ. Bot., 62, suppl. (1924) p. 44; *Sanicula montana* BLUME, Catal. (1823) p. 54, nomen; Bijdr. Fl. Ned. Ind., 15 (1826) p. 882; D. C., Prodr., 4 (1830) p. 85; JUNGHUHN, in Nat. & Geneesk. Arch. Ned. Ind., 2 (1845) p. 29; ZOLL. & MOR., in MORITZI, Syst. Verz. 1842—1844 (1846) p. 41; MOLKENBOER, in MIQ., Pl. Jungh., p. 93 (1851) cum var. *genuina, javanica, divaricata*; MIQUEL, Fl. Ind. Bat., I, 1, p. 736 (1856) cum var. *genuina, javanica, divaricata*; suppl. Sum. (1860) p. 134; TEYSMANN & BINNEND., Cat. pl. Hort. Bot. Bogor. (1866) p. 165; FILET, Plantk. Woordenb. (1876) p. 95; BECCARI, Malesia, 1 (1877) p. 219; in Bot. Jahrb., 1 (1881) p. 29; MOHNIKE, Blicke Pflanz. & Tierleben Nied. Malaienländern (1883) p. 268; WIGMAN in Teysmannia, 4, p. 742 (1893); MASSART, in Mém. Soc. Roy. Belg., 34, p. 222, 262, 265, 269, 338 (1895); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 137 (1898); KOORDERS, in Nat. Tijdschr. Ned. Ind., 60, p. 371 (1901); WIGMAN, in Teysmannia, 15, p. 459 (1904); DE CLERCQ, Plantk. Woordenb. (1909) p. 321; ERNST, in Veg. Bild., 7 Reihe, Heft 1—2, Taf. 1—3 (1909); KOORDERS, in Bot. Jahrb., 50, suppl. (1914) p. 285; *Sanicula montana* var. *genuina* & var. *javanica* ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 138; *Sanicula elata* var. *normalis* & var. *partita* KUNTZE, Rev. gen. pl., 1 (1891) p. 269; *Sanicula europaea* var. *javanica* WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 61, p. 64 (1913); MERRILL, Enum. Phil. Fl. Pl., 3 (1923) p. 238.

The Malaysian *Sanicula europaea* is rather uniformous. BLUME distinguished a *Sanicula javanica* from a *S. montana*, the former with 5-lobed, the latter with ternate leaves. MOLKENBOER united the two under the name *S. montana*, but distinguished 3 varieties, *genuina, javanica,* and *divaricata*, mainly based on the length of the involucres and the development of the pedicels of the male and female flowers. MIQUEL (in Ill. Fl. Arch. Ind., p. 40) united this *S. montana* with *S. elata* D. DON, from the Himalaya. KUNTZE distinguished in this *S. elata* the varieties *normalis* and *partita*, the former with less, the latter with more strongly incised leaves. C. B. CLARKE rightly united all these forms with *S. europaea*.

The varieties distinguished by MOLKENBOER and KUNTZE are too slight to be named. The Malaysian form differs, however, more distinctly from the European form, by the umbels arranged in widely branched di-mono-

chasia, whereas the European form has more crowded inflorescences and the flowers consequently nearly arranged in a compound umbel.

The elevations on which *S. europaea* is found in Malaysia vary from 500—3060 m.

MALAY PENINSULA. Pahang, Telom valley, RIDLEY 13540 (S); Lubok Tamang, 1050 m el., HENDERSON 11033, 10953 (S).

SUMATRA. Above Takingeun, 1275 m el., VAN STEENIS 5981 (B); Berastagi, BURKILL 12 (S); Karo Plateau nr. Kabandjahé, 1200 m el., LÖRZING 6214 (B, L); nr. Siberaja, Laoebiang valley, 1150 m el., LÖRZING 9536 (B); Deleng Koetoe, 1250 & 1450 m el., LÖRZING 4951 (B); Toba Plateau, nr. Paranginom, 1300 m el., OUWEHAND 367 (B); central Habinsaran nr. Parsoboeran, ravine Aèk Gerat, 1000 m el., LÖRZING 7818 (B); Sumatra's Westkust, KORTHALS s.n. (L); G. Talakmau, plateau at 2800 m el., BÜNNEMEIJER 839 (B); G. Singgalang, BECCARI P.S. 331 (L); G. Singgalang, 1050 m el., MATTHEW s.n. (K); 1650 m el., BÜNNEMEIJER 2579 (B, L, S); 2500 m el., BÜNNEMEIJER 2659 (B, L, U); forest above 2000 m el., LEEFMANS 27 (B); G. Talang, 2200 m el., BÜNNEMEIJER 5544 (B); G. Marapi, 1850 m el., BÜNNEMEIJER 4586 (B, L, S, U); 2650 m el., BÜNNEMEIJER 5018 (B, BD, L, U); G. Malintang, 1100 m el., BÜNNEMEIJER 3562 (B, BD, L, S); Bt. Nantigo, 1250 m el., BÜNNEMEIJER 3790 (B); Sedarang Agong, 735 m el., RIDLEY l. c.; G. Kerintji, Sumatra Expedition 1877—1878 s.n. (L); 2190 m el., ROBINSON & KLOSS s.n. (S); Bt. Tebakar, 1200 m el., BÜNNEMEIJER 8186 (B, L, S); G. Kerintji, 1550—2900 m el., BÜNNEMEIJER 8794, 9112, 10166, 10414, 10526, 9664, 9202, 9783, 9960, 9986, 9987, 9988 (B); 2500—2800 m el., STOUTJESDIJK 2 (B); 3000 m el., MATTHEW s.n. (K); between Kajoe Aro and the summit, Pondok Boenga, 3000 m el., FREY-WYSSLING 129 (B); Balalau, 900 m el., FORBES 1952 (L); G. Kaba, 1500 m el., DE VOOGD 506 (B); G. Dempo, 1400 m el., AJOEB (exp. JACOBSON) 439 (B); 2220 m el., FORBES 2402 (BD, L); G. Raja, 1000—1643 m el., VAN STEENIS 3566 (B); Bengkoeloe, Liwa, 900 m el., DE VOOGD 41 (B); G. Tanggamoes, 2000 m el., LIEFTINCK 22 (B).

BORNEO. Mt. Kinabalu, CLEMENS s.n. (B); Lobang, CLEMENS 10330 (B); Silau Basin, 1650 m el., CLEMENS 29725 (B); Colombon River basin, 1200 m el., CLEMENS 34031 (B); Penibukan, under Dahobang falls, 1200 m el., CLEMENS 30682 (B).

JAVA. Without exact locality: BLUME s.n. (L, U); ZIPPELIUS s.n. (L); KORTHALS 202 & s.n. (L); JUNGHUHN s.n. (L); WAITZ s.n. (L), v.n.: *daun katepan*; JAGOR s.n. (BD); HILLEBRAND s.n. (BD); „Harriang" VAN HASSELT 54 (L); „Gondang Banteng" WICHURA 2137 (BD); G. Karang, above Pandeglang, 600 m el., BACKER 7379 (B, L); Nirmala, s.w. of Buitenzorg, ravine of the Tjikaniki, 1100 m el., BACKER 10872 (B); Tjiapoes, HALLIER s.n. (B, L); G. Pangrango, HASSKARL 131 (B), original of *Sanicula javanica* BLUME; „Tjicoppo" on G. Gedé nr. Poentjak, BOERLAGE s.n. (L); Tjibodas, 1400—1500 m el., SCHEFFER s.n. (B, L); DE MONCHY s.n. (B, L) HALLIER 72 (L, B), 438 (B); KOORDERS 31679 β (B); VOLKENS 178 (BD); PULLE 4030 (U); VAN HARREVELD s.n. (G); BURKILL 8156 (S); SAPEI 448 (S); DANSER 5720 (G); VAN STEENIS 1851 (B); Tjibeureum, 1650 m el., WICHURA 2136 (BD); between Tjibeureum & Kandang Badak, WARBURG 3124 (BD); below Kandang Badak, 2000—2400 m el., DANSER 6145 (G); 2400 m el., KOORDERS 31800 β (B); REYNVAAN 45 (B); 2400—

2700 m, BACKER 31295 (B); crater Pangrango, 3000 m, REYNVAAN 193 (B); summit, 3060 m el., VAN HASSELT 534 (L); POSTHUMUS 157 (B); G. Gedé, eastern slope, 1420 m, BACKER 3208 (B); 2400 m, BACKER 3252 (B); southern slope, 1800 m el., BACKER 14715 (B); Geger Bintang, 1600 m el., DEN BERGER 596 (B); Sindanglaja, PLOEM s.n. (B); HULLET s.n. (S); Tjireunghas, nr. Soekaboemi, 900—1000 m el., BACKER 14939 (B); forest Takokak, 1000 m el., KOORDERS 15057 β (B), v.n.: *kundje*; 15244 β (B), v.n.: *tespong*; Tjadasmalang nr. Tjibeber, 1000 m el., BACKER 22374 (B); BAKHUIZEN VAN DEN BRINK 1867, 2138, 2056 (B), 2421 (B, L), v.n.: *tetespongan*; G. Malang, s. of Tjireunghas, 1000 m el., BACKER 31916 (B); G. Boerangrang, n. slope, 900 m, BACKER 14124 (B); Wanajasa, s. of Poerwakarta, BAKHUIZEN VAN DEN BRINK 4661 (B, L); Pasir Limoes, 1000 m el., BAKHUIZEN VAN DEN BRINK 4359 (B, L); G. Tangkoebanprahoe, s. slope, 1600 m el., BACKER 2421 (B); 1800 m el., BACKER 30895 (B); Lèmbang, VAN WELSEN 22 (B); G. Semboeng, s.w. of Bandoeng, 1300 m el., BACKER 12205 (B); Kendeng nr. Bandoeng, DOCTERS VAN LEEUWEN s.n. (B); Rawa Tjangkoan, SCHEFFER s.n. (B), v.n.: *antanan*; G. Malabar, WARBURG 11242 (BD); 1800 m el., FORBES 820 (B); 1800—2100 m el., JAGOR 379 (BD); 2300 m el., VAN SLOOTEN 299 (B); 1400—2000 m el., DENKER 79 (B); Tjinjiroean, 2000 m el., KEUCHENIUS s.n. (B); RANT s.n. (B); Pengalengan, 600 m el., FORBES 1020 (BD, L, S); between Tjikakoeripan & G. Patoeha, WARBURG 3123 (BD); estate Soekahati, 1200 m el., LEEFMANS s.n. (B); G. Patoeha, 2000 m el., LÖRZING 1343 (B, L, S); G. Wajang, between Soemadra & Taloen, 1250 m el., BACKER 5640 (B); G. Papandajan, KORTHALS s.n. (L); Tegal Pandjang, 2041 m el., VAN STEENIS 4337 (B); crater margin, 2450 m el., VAN DER PIJL 465 (B); above the ravine of the Tjiparoegpoeg, 2500 m el., VAN STEENIS 4129 (B); G. Telagabodas, BURCK 532 (B, L); BOERLAGE s.n. (L); 1300—1600 m el., KOENS 282, 253 (B); nr. pasanggrahan Pangentjongan, 1400—1600 m el., KOORDERS 26530 β, 40561 β (B); above Pangentjongan, 1500 m el., BACKER 31917 (B, L); G. Djaja, 1470 m el., LAM 161 (B); G. Tjikoeraj, SCHEFFER D60 (B), v.n.: *doelang sontog*; above Waspada, 1700 m el., BACKER 5335 (B); G. Galoenggoeng, above Sigaparna, 800 m el., BACKER 8624 (B, L); G. Mandalagiri, Pamegatan, VAN RIJCKEVORSEL 47 (B); Noesa Gedé, in the Pendjaloe Lake, 720 m el., KOORDERS 47887 β (B); G. Goentoer, 1300—2000 m el., KOENS 367 (B); G. Tjerimai, ZIPPELIUS s.n. (L); BLUME s.n. (B, L); N.E. slope, 700 m el., BACKER 4819 (B, L); Petoengkriana, s. of Pekalongan, 1500 m el., BACKER 15906 (B, BD, L); G. Tjedana nr. Madjenang, 700 m el., BACKER 18658 (B); G. Slamet, above Batoe Raden, 700—800 m el., BACKER 178 (B, L), v.n.: *gletang warak*; 1800 m el., LAM 2122 (B); 2150—2440 m el., BACKER 436 (B); 2500 m el., BACKER 514 (B); forest Pringamba, KOORDERS 27125 β (B); 37466 β (B), v.n.: *kepotong*; Diëng, JUNGHUHN s.n. (L); HILLEBRAND s.n. (BD); WARBURG 4390 (BD); plateau, 2000 m el., BACKER 21601 (B); G. Prahoe Diëng, JUNGHUHN s.n. (L); 2000 m el., LÖRZING 317 (B); Wanasaba, 800 m el., BRINKMAN 268 (B); Garoeng nr. Wanasaba, 1100—1600 m el., BACKER 21976 (B); G. Pangonan, 2150 m el., VAN SLOOTEN 366 (B); Diëng-wètan, 2000 m el., WIRJOSAPOETRO 70 (L), v.n.: *pontjoboemi*; G. Soendara, 2500 m el., DOCTERS VAN LEEUWEN 8964 (B); G. Soembing, 2100 m el., LÖRZING 38 (B, BD), v.n.: *tjakar ajam, pulatjeng*; G. Oengaran, JUNGHUHN s.n. (U); 1000 m el., DOCTERS VAN LEEUWEN s.n. (B); nr. Medini, 900—1200 m el., JUNGHUHN s.n. (L), v.n.: *traseng*; WAITZ s.n. (L); slope Soerolaja, 700 m el., DE VISSER SMITS s.n. (B); G. Telamaja, KOORDERS 28050 β (B), v.n.: *oerek polo*; 1400 m el., KOORDERS 35976 β

(B); G. Merbaboe, e. slope, JUNGHUHN s.n. (L); 1900 m el., DE BEYER 93 (B), v.n.: *sledren*; above Salatiga, 2000—2400 m el., BACKER 30264 (B); G. Merapi. 1200 m el., JUNGHUHN s.n. (L); nr. Andong, 900 m el., JUNGHUHN s.n. (L); G. Plampangan, at foot of G. Merapi, 750 m el., BEUMÉE A120 (B); Wanasari, 1000 m el., MOUSSET 59 (L); G. Lawoe, above Djagaraga, 850 m el., BACKER 6729 (B, L); 1000 m el., BLOKHUIS s.n. (B); Sido Ramping, Gandong valley, 1300—1400 m el., ELBERT 301 (L); G. Wilis, 1200 m el., LÖRZING 819 (B); nr. pasanggrahan Ngebel, 1300—1400 m el., KOORDERS 23276 β (B), v.n.: *seledren*; 1600 m el., DEN BERGER 702 (B); above Kediri, 1700—1800 m el., BACKER 11590 (B); G. Pitjis, KOORDERS 29477 β (B); G. Ardjoena, Prigen, RANT s.n. (B); Trètès, 800 m el., BREMEKAMP s.n. (B); 2400 m el., ZOLLINGER 1915 (B, BD, S); G. Kawi, 1500 m el., WISSE 259 (B); Oro-oro plain, spring Sebaloe, 2690 m el., ARENS & WURTH s.n. (B); Tjamara Kandang, 2700 m el., DOCTERS VAN LEEUWEN 12274 (B); G. Tengger, Lawang, MOUSSET 59 (B); Poesoengsadjimah, s. of Malang, 850—1150 m el., VAN OOSTEN 13 (B); 1500—1800 m el., ZOLLINGER 1747 (BD, L); dèsa Ngepoeh, 1100—1600 m el., VAN HARREVELD-LAKO 24, 65 (B); Nangkadjadjar, 1200 m el., WISSE 654 (B); 1230 m el., BUYSMAN 3009 (U); Klètak, 1800 m el., DOCTERS VAN LEEUWEN 4540 (B); Ngadisari, 2200 m el., KOORDERS l.c.; G. Kembang, 2300 m el., KOORDERS 37887 β (B, L), v.n.: *toembaran idjoe*; 2500 m el., BACKER s.n. (B); G. Seméroe, above Kaliglidik, 1300 m el., BACKER 3593 (B); G. Widadarèn, 1750 m el., BACKER 3610 (B, L); G. Argapoera, 800 m el., BACKER 13191 (G); G. Ijang, 1900 m el., CLASON G39 (B, G); Tjemaralantjang, 2100 m el., BACKER 9761 (B, L); G. Koekoesan, 2000 m el., JESWIET 479 (B); Ijang, on the plateau, 2100 m el., KOORDERS 43466 β (B); Kajoemas, OTTOLANDER 356 (B, L), v.n.: *slerem, gali*; G. Idjen, 1200 m el., BACKER 25364 (B); Pantjoer Idjen, 1450 m el., KOORDERS 32561 β (B); Gendingwaloeh, 1450 m el., KOORDERS 43162 β (B); Kalibendo, 800 m el., KOORDERS 43163 β (B); G. Raoeng, Soemberwringin, 1250 m el., CLASON 130 (B, G).

TIMOR. Goenoeng Moetis, 2000 m el., DE VOOGD 2299 (B).

SELEBES. Teloek Manipi, WARBURG 16131 (BD); G. Bantaèng, EVERETT 33 (S); Rante Lemo, 1400 m el., KJELLBERG 1541 (B).

SERAN. Hatoemete Pass, 500—700 m el., KORNASSI 620 (B).

Distribution: temperate and tropical parts of Europe, Africa, and Asia.

V. ERYNGIUM

LINN., Sp. pl., ed. 1 (1753) 1, p. 232; Gen. pl., ed. 5 (1754) p. 108; BENTHAM, Fl. austr., 3 (1866) p. 369; BENTH. & HOOK.F., Gen. pl., 1, p. 878 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 669 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 614; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 139; WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 61 (1913) p. 106; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 974 (1925).

Only species:

1. **Eryngium foetidum** LINN., — Herb, 15—60 cm high. Main root fusiformous. Stem many times di-mono-chasially branched with spreading

branches, nearly glabrous, grooved. Leaves nearly all of them in a rosette, lanceolate-spathulate, 3—32 cm long, 1—4 cm broad, obtuse, sessile with more or less narrowed sheathy base and dentate margin, the teeth crowned by a stinging hair, glabrous. Bracts of the inflorescence palmatilobate to -partite, 1—6 cm long, with spiny apices and teeth, strongly nerved, the lowermost often more like normal leaves. Heads 5—10 mm long, cylindrical, on 1—10 mm long peduncles; involucral bracts 5—7 in number, spreading, nearly lanceolate, with few spiny teeth. Flowers sessile in the axils of narrow, membranous-margined, 1.25—1.5 mm long bracts. Calyx teeth distinct, nearly 0.75 mm long, lanceolate, acute, with narrow membranous margin; petals 0.5—0.75 mm long, nearly 0.25 mm broad, the inflexed tip excluded. Fruit with very indistinct ribs, densely warty, glabrous; mericarps 1—1.5 mm long, 0.5—0.75 mm broad.

Eryngium foetidum LINN., Sp. pl., ed. 1 (1753) 1, p. 232; D. C., Prodr., 4 (1830) p. 94; TEYSMANN & BINNENDIJK, Cat. Pl. Hort. Bot. Bogor. (1866) p. 165; EDELING, in Nat. Tijdschr. Ned. Ind., 31, p. 294 (1870); HIERN, in Fl. Trop. Afr., 3 (1871) p. 6; BOERLAGE, in Handel. Tweede Nat. & Geneesk. Congres (1889) p. 3; Handl. Fl. Ned. Ind., I, 2 (1890) p. 615; KUNTZE, Rev. gen. pl., 1 (1891) p. 267; WIGMAN, in Teysmannia, 4, p. 391, 392 (1893); MASSART, in Mém. Soc. Roy. Bot. Belg., 34, p. 181, 195, 329 (1895); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 142 (1898); KOORDERS, in Nat. Tijdschr. Ned. Ind., 60, p. 394 (1901); KING, Mat. Fl. Mal. Pen., 13 (1902) p. 599; BACKER, in Ann. Jard. Bot. Buitenz., suppl. 3, 1 (1910) p. 402; KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228, p. 98 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 724; WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 61 (1913) p. 203; BOLDINGH, Zakfl. landbouwstr. Java (1916) p. 174; HEYNE, Nutt. pl. Ned. Ind., ed. 1, 3 (1917) p. 396; RIDLEY, Fl. Mal. Pen., 1 (1922) p. 870; KOORDERS, Fl. Tjibod., 2, p. 233 (1923); CHERMEZON, in LECOMTE, Fl. Indo-Ch., 2, p. 1140 (1923); BACKER & VAN SLOOTEN, Handb. Jav. Theeonkr. (1924) p. 186, cum ic.; OCHSE, Trop. groenten (1925) p. 189, cum ic.; HEYNE, Nutt. pl. Ned. Ind., ed. 2 (1927) 2, p. 1211; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. III, suppl. 1 (1930) p. 131; OCHSE & BAKHUIZEN, Ind. groenten (1931) p. 710, ic. 431; CRAIB, Fl. siam. enum., 1, p. 788 (1931); ALSTON, in TRIMEN, Handb. Fl. Ceyl., 6 (1931) p. 138; BACKER, Fl. Jav. Suikerrietgr., p. 475 (1931); BURKILL, Dict. Econ. Prod. Mal. Pen., 1 (1935) p. 944.

Eryngium foetidum **has been introduced from Tropical America as a weed, but is entirely naturalized now in the Malay Peninsula, Sumatra, and Java. The oldest specimens seen from the Malay Peninsula have**

been collected in Negri Sembilan in 1888, in Penang in 1889, in Pulau Butong in 1890, in Johore in 1894. The oldest ones from Java have been collected near Buitenzorg in 1893, near Takokak in 1894, near Ngebel in 1896, near Pringamba in 1897, on the Goenoeng Telamaja in 1897, near Sepakoeng in 1899. The oldest ones from Sumatra have been collected in 1915 near Moearadoea, and near Sibolangit in 1917.

From botanical literature we see that the species was observed as early as 1869 near Bidaratjina by EDELING (l. c.). KUNTZE (l. c.) mentions it as seen by him near Buitenzorg in 1875, BOERLAGE (l. c.) found it near Palaboehanratoe in 1888.

MALAY PENINSULA. Penang, CURTIS s.n. (S); nr. Chinese house, Batu Itam, CURTIS s.n. (S); Ginting...? BURKILL 3051 (S); Pulau Boetong, CURTIS s.n. (S), v.n.: *kangkong kerbau*; Perak, Kuala Kendrong, Grik, BURKILL & HANIFF 12446 (S); Selangor, Ginting Sempak, HAMID 10259 (S), v.n.: *jeraju gunong*; HUME 8965 (S); Negri Sembilan, Bukit Tumiang, ALVINS 1612 (S), v.n.: *pokô kulumbar*; Pahang, Raub Track, MACHADO 11544 (S); Malacca, CANTLEY'S COLL., s.n. (S); Johore, Tanjong Kupang, RIDLEY s.n. (S); Singapore, Chan Chu Kang, RIDLEY s.n. (S); Bajau, RIDLEY s.n. (S); Kandang Kerbau, RIDLEY 10411 (S).

SUMATRA. Sibolangit, Botanic Garden, 500 m el., LÖRZING 5263 (B, L, U); G. Kerintji, Bt. Tebakar, 850 m el., BÜNNEMEIJER 7956 (B, L, S), v.n.: *oemboe palembang*; Moeara Doea, 600 m el., GRASHOFF 530 (B), v.n.: *ketoembor djawa*.

JAVA. Without exact locality: HILLEBRAND s.n. (BD); Bantam, Pasaoeran, 30 m el., BACKER 7265 (B); Rangkasbitoeng, 50 m el., BACKER 1074 (B), v.n.: *walang*; between Tjitorek & Moentjang, 400 m el., BACKER 1830 (B); between Tjilèlès & G. Kentjana, 200 m el., BACKER 1190 (B); between Bajah & G. Madoer, 25 m el., BACKER 1664 (B, L), v.n.: *walang*; Sadjira, 150—200 m el., BACKER 2039 (B); between G. Kentjana & G. Kendeng, 300 m el., BACKER 1289 (B); between Malingping & Pengawoengan, 5—25 m el., BACKER 1466 (B, L); Batavia, Tjempakapoetih, 5 m el., BACKER 32138 (B, L); G. Sahari, Sentiong, 5 m el., BACKER 32130 (B, L); Kerendang, 5 m el., BACKER 32135 (B); between Batavia & Meester Cornelis, 15 m el., BACKER 32137 (B); near Bidaratjina, anno 1869, EDELING l. c., first record; Tjigombong, 600 m el., KEUCHENIUS s.n. (B); Tjigombong, nr. Buitenzorg, 500 m el., VAN STEENIS 57 (B); between Djasinga & Pasir Madang, 100—500 m el., BACKER 10336 (B, L); Nirmala, 900 m el., BACKER 11116 (B, L, U); Tjidoedjoeng, n. of Buitenzorg, 150 m el., BACKER 22712 (B); between Buitenzorg & Batoetoelis, HALLIER 130a (B, L); Tjiomas, 250 m el., SOEGANDIREDJA 98 (B, L), v.n.: *walang*; G. Batoe nr. Tjianten, s. of Leuwiliang, 1000 m el., BACKER 25760 (B); Pasir Karèt nr. Buitenzorg, 800 m el., BACKER 32134 (B); Bondongan, HALLIER 130d (B); Buitenzorg, 250 m el., BOERLAGE s.n. (L); HALLIER 130b, 130c (B); KOORDERS 32613β (B), v.n.: *walang*; AXEL PREYER s.n. (BD), v.n.: *rumput walang*; WARBURG 11429 (BD); DANSER 5361, 6883 (G); G. Parang, 500 m el., BACKER 13943 (B); between Poerwakarta & Wanajasa, 300—650 m el., BACKER 14391 (B); Tjibadak, 380 m el., BACKER 592 (B); Paroengkoeda, 500 m el., A. M. DE VRIES 8 (B); between Soekaboemi & Njalindoeng, 500—700 m el., BACKER 14546 (B); G. Malang, s. of Tjireunghas, 1000 m el., BACKER 32132 (B); Leuwimanggoe, s. of Tjibeber, 1000 m el., SIKAJA

s.n. (B), v.n.: *katjoentjar walanda*; Tjidadap, s. of Tjibeber, 1000 m el., WINCKEL 1146 β (B), v.n.: *katoentjar walanda, walang kendi*; BAKHUIZEN VAN DEN BRINK 4389 (B, L), v.n.: *katoentjar blanda, balang katoentjar, walang katoentjar, katoentjar walang, walang andjing, walang, walang geni, singadepa*; Tjiandjoer, 500 m el., BACKER 3090 (B, L); Kiara Pajoeng, 500—600 m el., ZWAARDEMAKER 105, v.n.: *walang* (B); 550—700 m el., BACKER 23629 (B); Takokak, 1000 m el., KOORDERS 15269 β (B), v.n.: *katoentjar walanda*; KOORDERS 15135 β (B), v.n.: *kapoentjar*; G. Gedé above Tjiandjoer, 800 m el., BACKER 21569 (B); Tjibodas, 1200 m el., KOORDERS 31918 β (B), v.n.: *walang langit*; G. Tangkoebanprahoe, below Lèmbang, 1000 m el., BACKER 32136 (B); Dago, 800 m el., KOORDERS 44301 β (B); Togagapoe, w. of Bandoeng, 650 m el., LÖRZING 1111 (B, L), v.n.: *walang*; Tjilebak on the Tjitaroem, 660 m el., WISSE 905 (B); Palaboehanratoe, BOERLAGE s.n. (L), v.n.: *katoentjar walanda*; Bodjong Lopang, 500—600 m el., BACKER 16924 (B, L); Lengkong, 600 m el., BACKER 17073 (B), v.n.: *katoentjar, katoentjar walanda*; Pasawahan, 400 m el., BACKER 2224 (B); Tjiratjap, 25—100 m el., BACKER 17380 (B); Djampang Koelon, Tjitjoeroeg, 300 m el., BACKER 17230 (B); between Taloen & Tjinjiroean, 1600 m el., BACKER 5719 (B); G. Goentoer, s. slope, 1500—2000 m el., KOENS 105 (B); Tjisoeroepan nr. Garoet, 1200 m el., KOENS 493 (B); between Garoet & Tjipanas, 750 m el., BACKER 5169 (B); between Soekaradja & Singaparna, 350 m el., BACKER 8470 (B), v.n.: *walang*; G. Mandalagiri, 1350 m el., VAN VUUREN s.n. (B), v.n.: *walang*; bivouac Denoe, on the Tji Patoedjah, 300 m el., BACKER 9042 (B); Noesagedé in the Pendjaloe Lake, 720 m el., KOORDERS 47888 β (B); Tjiamis, 350 m el., BARENDS s.n. (B), v.n.: *walang*; Bantardawa nr. Bandjar, 50 m el., BACKER 32131 (B); Rawah Lakbok, s. Tjikawoeng, 20 m el., BACKER 4294 (B); between Tjerebon & Koeningan, 340—500 m el., BACKER 4768 (B); Tegal, forestry Margasari, 90 m el., NOLTÉE 2590 (B); Petoengkriana, 900 m el., BACKER 15960 (B); between Slawi & Balapoelang, 50—100 m el., BACKER 15364 (B, L); between Dara & Petoengkriana, 300 m el., BACKER 15726 (B); Dara, 100 m el., BACKER 15615 (B); Madjenang, 30—100 m el., BACKER 18428 bis (B); G. Slamet, Kalibakoeng, 360 m el., HAGEDOORN & JESWIET s.n. (B); G. Slamet, above Batoe Raden, 700—800 m el., BACKER 160 (B); Wadas Poempang nr. Patikradja, 200 m el., BEUMÉE 4809 (B); Poerwokerto 75 m el., BACKER 6 (B); 300 m el., BACKER 116 (B), v.n.: *moengsi*; Karanganjar, KOORDERS 26231 β (B), v.n.: *toembaran oenga*; Bandjarnegara, between Pringamba & Desa Sawal, KOORDERS 27118 β (B), v.n.: *djinten*; between Wanasaba & Garoeng, 800—1100 m el., BACKER 21989 (B); Temanggoeng, 600 m el., LÖRZING 350 (B, BD), v.n.: *toembaran, ketoembar landa*; Magelang, 380 m el., VAN OOSTEN 19 (B); Daroepana, 100 m el., BACKER 16447 (B); Oengaran, Garoong, 1200 m el., DOCTERS VAN LEEUWEN s.n. (B); G. Telamaja, KOORDERS 28011 β (B), v.n.: *toembaran*; Sepakoeng, 1000 m el., KOORDERS 35917 β (B), v.n.: *ketoel kebo*; Salatiga, DOCTERS VAN LEEUWEN s.n. (B); G. Kidoel, between Djepitoe & Kalak, 200 m el., BACKER 2841 (B), v.n.: *djintenan*; G. Lawoe nr. Girimoeljo, 600 m el., BACKER 6790 (B); G. Wilis, w. slope, 250 m el., WISSE s.n. (B), v.n.: *djintenan*; Ngebel, 900 m el., KOORDERS 23252 β (B), v.n.: *toembaran*; between Toelahan & Tegalombo, 500 m el., BACKER 2920 (B); between Sripit & Prigi, 150 m el., LÖRZING 1004 (B); Prigi, 8 m el., LÖRZING 1047 (B); Modjokerto, Dampak nr. Segoenoeng, 700 m el., WINCKEL s.n. (B); Poenten, 1100 m el., HOFSTEE 14 (B); Malang, 450 m el., WISSE 242 (B); Djember, 83 m el., ULTÉE 3 (B); 100 m el., BACKER 17719 (B, L).

Distribution: indigenous in tropical America, introduced in few parts of Tropical Africa and Asia.

VI. CHAEREFOLIUM

HALLER, Hist. Stirp. Helv., 1 (1768) p. 327; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1014 (1926); *Anthriscus* PERSOON, Synops., 1 (1805) p. 320; BENTHAM & HOOKER FIL., Gen. pl., 1, p. 899 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 692 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 619; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 152 (1898).

Only species:

1. **Chaerefolium Cerefolium** (LINN.) SCHINZ & THELLUNG — Herb, somewhat hirsute. Stems 25—50 cm high, striate and grooved. Petioles of the lower leaves up to 7 cm long, with sheathy base, upper leaves with shorter petioles or sessile on the sheaths; laminae of the lower leaves triangular in outline, 4—11 cm long, 3—15 cm broad, bi- to tripennate, the primary leaflets ovate, obtuse, with 0.5—2.5 cm long petiolules, the secondary leaflets ovate, pennatipartite, with obtuse apices. Inflorescence a di-monochasium of sessile compound umbels; involucres none; involucels with 3—4 bracts nearly 2 mm long, 0.75 mm broad, lanceolate, acute, with narrow membranous margin; rays of the main umbel 3—5 in number, 5—25 mm long; pedicels 4—9 in number, 2—4 mm long, when flower-bearing, up to 5 mm long when fruit-bearing. Petals white, nearly 1—1.5 mm long, 0.5—1 mm broad, obcordate, with short inflexed tips. Mericarps 5—6 mm long, up to 1 mm broad, sometimes hirsute with antrorse hairs when unripe, black and finely granular when ripe, grooved at the inside, bearing a beak up to 2.5 mm long and nearly 0.5 mm broad; stylopodium flat. (Description after European materials.)

Scandix Cerefolium LINN., Sp. pl., ed. 1 (1753) p. 257; *Anthriscus Cerefolium* HOFFMANN, Gen. Pl. Umbellif. (1814) p. 41; D. C., Prodr., 4 (1830) p. 223; MIQUEL, Fl. Ind. Bat., I, 1, p. 744 (1856); BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 212; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 619; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 152 (1898); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 725; *Chaerefolium Cerefolium* SCHINZ & THELLUNG, in Vierteljahrsschr. Naturf. Gesellsch. Zürich, 53, p. 554 (1909); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1027, ic. 2384 (1926).

Java, cultivated according to MIQUEL, BOERLAGE, KOORDERS ll. cc.; no specimens seen.

Distribution: indigenous in S.E. Europe and W. Asia (THELLUNG, l. c.), cultivated and subspontaneous in all parts of the world.

VII. TORILIS

ADANSON, Fam. pl., 2 (1763) p. 99; MIQUEL, Fl. Ind. Bat., I, 1, p. 743 (1856); BENTHAM & HOOK.F., Gen. pl., 1, p. 928 (1867); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 625; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 155 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1048 (1926).

Only species:

1. **Torilis japonica** (HOUTTUYN) D. C. — Annual or perennial herb. Stem to more than 1 m high, finely striate, rough by appressed bristles. Leaves triangular in outline, acuminate, sparingly appressedly hirsute, pennate with leaflets pinnatipartite, the segments pinnatifid to serrate. Inflorescences terminal and axillary; peduncle 5—20 cm long; involucre 2—6-leaved; involucels with 3—7 nearly filiformous bracts; umbel-rays 0.5—3 cm long, 4—12 in number, antrorsely hirsute; pedicels 4—10 in each umbellule, 1—4 mm long, hirsute like the peduncle. Calyx teeth distinct, nearly 0.5 mm long, triangular-lanceolate, mucronulate; petals 0.5—1 mm long and broad, obcordate with inflexed tip, appressedly hairy outside. Mericarps about 4 mm long, 1.5 mm broad, oblong, with obtuse ribs, and with densely placed uncinate bristles in the grooves between the ribs. (Description after the materials under mentioned.)

Tordylium Anthriscus LINN., Sp. pl., ed. 1 (1753) 1, p. 240; *Caucalis Anthriscus* HUDSON, Fl. angl., ed. 1 (1762) p. 99; D. DON, Prodr. fl. nep. (1825) p. 183; CLARKE, in HOOK. FIL., Fl. Br. Ind., 2, p. 718 (1879); KUNTZE, Rev. gen. pl., 1 (1891) p. 266; *Caucalis japonica* HOUTTUYN, Nat. Hist., II, 8 (1777) p. 42, t. 45, 1; *Torilis Anthriscus* (non GAERTN. 1788) GMELIN, Fl. bad., 1 (1806) p. 615; D. C., Prodr., 4 (1830) p. 218; WIGHT & ARN., Prodr. (1834) p. 374; MIQUEL, Fl. Ind. Bat., suppl. Sum. (1860) p. 134, 336; TEYSMANN & BINNEND., Cat. pl. Hort. Bot. Bogor. (1866) p. 166; FILET, Plantk. Woordenb. (1876) p. 13; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 625; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 156, ic. 58L—N (1898); MATSUMURA & HAYATA, Enum. pl. Formos. (1906) p. 174; KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228, p. 98 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 725; HAYATA, Ic. pl. Formos., 2, p. 57 (1912); BOLDINGH, Zakfl. Landbouwstr. Java (1916) p. 175; CHERMEZON, in LEC., Fl. Indo-Ch., 2, p. 1157 (1923); RIDLEY, in Journ. Mal. Br. Roy. As. Soc., 1, p. 63 (1923); THELLUNG,

in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1051, ic. 2315a, 2393—2395, t. 193. 3 (1926); RANT, in Nat. Tijdschr. Ned. Ind., 89, p. 451 (1929); VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 256 (1934); *Torilis japonica* D. C., Prodr., 4 (1830) p. 219; *Torilis scabra* (non D. C., 1830) ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 139; MIQUEL, Fl. Ind. Bat., I, 1, p. 744 (1856); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 625; KOORDERS, in Teysmannia, 11, p. 244 (1901); in Nat. Tijdschr. Ned. Ind., 60, p. 371 (1901).

According to THELLUNG (l. c.) *Torilis japonica* is indigenous in Europe, N. Africa, and temperate Asia, but introduced in S. Asia and America. In the latter countries it is said to have been introduced with clover-seed. Also VAN STEENIS (l. c.) considers *T. japonica* as an alien in Sumatra and Java.

According to CLARKE (l. c.) this species occurs in the Himalaya from 900 to 2700 m elevation. As so many other Himalaya plants also occur in the mountains of Sumatra and Java, it looks quite possible to consider *T. japonica*, too, as a species spread from the Himalaya southward along the mountain ridges of the islands mentioned, in a quite natural way, be it with help of man or not.

The plants from Java and Sumatra appear to agree entirely with the European form.

SUMATRA. Karo Plateau, Berastagi, 1300—1350 m el., LÖRZING 5919 (B, L), 6716 (B); Dolok Singgalang, N. of Lake Toba, 1450 m el., LÖRZING 8844 (B); nr. Raja, 1300 m el., LÖRZING 4904 (B); nr. Lingga, 1225 m el., LÖRZING 6269 (B, L); Nagasariboe, HAGEN s.n. (B); Sumatra's Westkust, Lolo, TEYSMANN 1609 H.B. (B, U), v.n.: *ambo-ambo.*

JAVA. G. Tengger, ZOLLINGER 2515 (BD); way to the Sand-sea, RANT s.n. (B); Ngadisari, KOORDERS s.n. (L); between Tosari & Ngadiwono, 1700—1800 m el., MOUSSET 705 (B); Tosari, 1800—2500 m el., KOBUS s.n. (B); 2000 m el., BACKER 8358 bis (B); near Klètak, DOCTERS VAN LEEUWEN 4566 (B); Ider-Ider, KOBUS 258 (B); Widadarèn, Kedoenen, 2400 m el., KOORDERS 37888 β (B, L), v.n.: *toembaran alas.*

Distribution: see the discussion above.

VIII. CORIANDRUM

LINN., Sp. pl., ed. 1 (1753) 1, p. 256; Gen. pl., ed. 5 (1754) p. 124; BENTHAM & HOOK.F., Gen. pl., 1, p. 926 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 717 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 622; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 158 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1071 (1926).

Only species:

1. **Coriandrum sativum** LINN. — Annual herb, entirely glabrous. Stems terete, striate, up to 75 cm high. Laminae of the lower leaves palmatilobate to -partite, those of the middle leaves pennate, with segments gradually narrower, obtuse, those of the upper leaves pennate to bipennate wtih segments 0.5 mm broad. Inflorescences terminal or seemingly lateral; peduncle 2—10 cm long; involucre none or reduced to one leaf up to 5 mm long; involucels with 3—5 bracts, that are linear up to 5 mm long by 0.5 mm broad; umbel rays 3—5 in number, 1—2.5 cm long; pedicels 3—5 in each umbellule, 3—5 mm long. Calyx teeth triangular-lanceolate to oblong-lanceolate, somewhat radiating, the outer ones nearly 1 mm long, the inner ones shorter. Petals radiating, the outer ones of the inflorescence 3—4 mm long, the other ones shorter, all of them deeply bipartite with inflexed apex. Mericarps 4 mm long, 2 mm broad, hollow at the inside, together forming a nearly globose fruit; primary ribs not prominent, visible as undulated lines, secondary ribs somewhat prominent, filiformous. (Description after all the plants under mentioned.)

Coriandrum sativum LINN., Sp. pl., ed. 1 (1753) 1, p. 256; D. C., Prodr., 4 (1830) p. 250; HASSKARL, Cat. Pl. Hort. Bot. Bogor. (1844) p. 164; MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 98 (1851); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 139; MIQUEL, Fl. Ind. Bat., I, 1, p. 744 (1856); TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 166; BENTHAM, Fl. Austr., 3 (1866) p. 336; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 43; HIERN, in Fl. Trop. Afr., 3 (1871) p. 3; FILET, Plantk. Woordenb. (1876) p. 159; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 717 (1879); BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 213; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 622; MASSART, in Mém. Soc. Roy. Bot. Belg., 34, p. 203, 327 (1895); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 159, ic. 43D, 59A—D (1898); KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; DE CLERCQ, Plantk. Woordenb. (1909) p. 210; KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228, p. 98 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 725; WIGMAN, in VAN GORKUM, O. Ind. Cult., 2, p. 882 (1913); VAN DONGEN, Overz. Geneesm. Ned. Ind. (1913) p. 130; BOLDINGH, Zakfl. Landbouwstr. Java (1916) p. 174; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 396; RIDLEY, in Journ. F. M. S. Mus., 8, 4 (1917) p. 42; CHERMEZON, in LEC., Fl. Indo-Ch., 2, p. 1156 (1923); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1071, ic. 2312f—g, 2316c, 2319a, 2321d—e, t. 194, 2 (1926); HEYNE, Nutt. Pl. Ned. Ind., ed. 2, 2 (1927) p. 1212; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. 3, suppl. 1 (1930) p. 82; OCHSE & BAKH., Ind. Groenten (1931)

p. 703, ic. 427; CRAIB, Fl. siam. enum., 1, p. 793 (1931); BURKILL, Dict. Econ. Prod. Mal. Pen., 1 (1935) p. 633.

SUMATRA. Atjèh, Gajo Loeëus, Panampakan, PRINGGO ATMODJO (exp. VAN DAALEN) 334 (B, L); Doerèn, PRINGGO ATMODJO (exp. VAN DAALEN) 343 (B, L); Palèmbang, Moearadoea, 650 m el., GRASHOFF 541 (B), v.n.: *ketoembor*; Sandaran Agong, 735 m el., RIDLEY l. c.; G. Pakiwang, N.W. of Danau Rana, 500 m el., VAN STEENIS 3770 (B).

JAVA. Without exact locality: ZOLLINGER 2757 (BD); Batavia, cultivated, SMITH s.n. (B, L), v.n.: *wansoei*; Ragoenan nr. Pasir Minggoe, OCHSE s.n. (B, S, U); between Batavia & Meester Cornelis, BACKER 34390 (B), cultivated; Buitenzorg, nr. veterinary school, BACKER 34391 (B); G. Gedé, e. slope, 1300 m el., BACKER 3180 (B); from Tjipatjèt nr. Sindanglaja, bought on the pasar at Buitenzorg, BAKHUIZEN VAN DEN BRINK 7412 (B), v.n.: *katoentjar*; Sindanglaja, 1075 m el., subspontaneous in a garden, BACKER 22793 (B, L, S); Lèmbang, cultivated, VAN WELSEM s.n. (B); Batoe, above Malang, 850 m el., ULTÉE 88 (B); Ngadisari, 2000—2200 m el., KOORDERS 38093 β (B), 37878 β (B, L), v.n.: *ketoembar*.

SELEBES. Tondano, FORSTEN s.n. (L).

Distribution: indigenous from Mediterranean region to Central Asia, cultivated and subspontaneous in nearly all parts of the world. (THELLUNG, l. c.)

IX. OREOMYRRHIS

ENDLICHER, Gen. pl., p. 787 (1839); HOOKER FIL., Fl. Nov. Zel., 1 (1853) p. 92; Handb. New. Zeal. Fl. (1864) p. 90; BENTHAM, Fl. austr., 3 (1866) p. 377; BENTHAM & HOOK.F., Gen. pl., 1, p. 897 (1867); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8 (1898) p. 163; CHEESEMAN, Man. N. Zeal. Fl. (1906) p. 205.

The genus *Oreomyrrhis* is spread in the mountains of Central and South America from Mexico to the Falkland Islands and moreover in those of Australia and New Zealand. The polymorphic *O. andicola* HOOKER F. covers the whole area of the genus, the other species are more local.

In the area dealt with in this paper 4 *Oreomyrrhis* forms have been collected. Two of these, from Borneo and New Guinea, have been taken up here as forms of *O. andicola,* two others, both from New Guinea, have been kept separated as distinct species.

Key to the species.

1 Leaves not compound, linear to narrowly spathulate . . . **3. O. linearis**
Leaves compound 2
2 Leaves pennate to bipennate, with the primary leaflets in several pairs . . **1. O. andicola**
Leaves subternate, with the lateral leaflets tripartite, the terminal leaflet ternate with tripartite segments . . . . **2. O. papuana**

1. **Oreomyrrhis andicola** HOOKER FIL. — Perennial herb. Main root fusiformous, bearing a caudex with few erect branches and one or more rosettes. Leaves 0.8—16 cm long; sheath 0.3—3 cm long, 1—3.5 mm broad in the lower portion, gradually tapering into the petiole, membranaceous towards the margin, glabrous or short-hirsute on the back side, short-hirsute or sparingly pilose inside, rather densely ciliate; petiole 0.3—10 cm long, canaliculate, glabrous or short-hirsute; lamina triangular-ovate in outline, 0.5—4 cm long, 0.4—1.6 cm broad, pennate to bipennate with 5—11 primary leaflets of which the lower ones sometimes (in large leaves) pennate again with 3—5 secondary leaflets, usually all leaflets pennatifid to pennatipartite with lanceolate 1—2.5 mm long, 0.25—0.5 mm broad, thin coriaceous, glabrous or shortly hirsute, sometimes finely ciliate, sometimes mucronulate segments and with sometimes recurved margin, the small leaflets only dentate with acute, 0.75—1 mm long, nearly 0.25 mm broad triangular teeth. Inflorescences simple umbels, one to several in each rosette (terminal or lateral?); peduncles 0.7—8 cm long, terete, densely hairy with spreading somewhat silky hairs or shortly hirsute towards the apex, sometimes glabrescent; pedicels 1—9 in each umbel, 0—0.5 mm long, sometimes growing out to 3 mm long when fruit-bearing; involucre with 5—10 bracts, that are ovate-lanceolate with broad base, 2—4 mm long, densely sericeous or shortly hirsute outside, sometimes finely ciliate. Calyx teeth none; petals broad-elliptic-ovate, nearly 1 mm long, shortly ciliate at the base or glabrous, white or sometimes reddish. Fruit nearly 2.5—3.5 mm long, oblong-ovate, somewhat incurved, 0.75—1.5 mm thick, 0.75—1.25 mm broad, with prominent ribs, densely short-hirsute or glabrous; stylopodium conical, nearly 0.5 mm high, 0.4 mm thick at the base, with 2 recurved obtuse tips; carpophore split down to the base, sometimes hirsute at the margins. (Description after the materials under mentioned.)

Myrrhis andicola KUNTH, in HUMB. & BONPL., Nov. gen. et sp., 5, p. 13, t. 419 (1821); *Caldasia andicola* D. C., Mém. Ombell., p. 60 (1829); Prodr., 4, p. 229 (1830); *Oreomyrrhis andicola* HOOKER FIL., Fl. antarct., 2, p. 288, t. 101 (1844—47) n.v.; BENTHAM, Fl. austr., 3 (1866) p. 377; *Oreomyrrhis Colensoi* HOOKER FIL., Fl. Nov. Zel., 1 (1853—55) p. 92, n.v.; Handb. N. Zeal. Fl., p. 91 (1864), p. 729 (1867); *Oreomyrrhis Haastii* HOOKER FIL., Handb. N. Zeal. Fl., p. 91 (1864); *Oreomyrrhis borneënsis* MERRILL, in Amer. Journ. Bot., 5, p. 515, ic. 36 (1918); Bibl. Enum. Born. Pl. (1921) p. 459; VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934); *Oreomyrrhis pumila* RIDLEY, in Trans-

act. Linn. Soc., ser. II, bot., 9, p. 63 (1916); VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934).

According to MERRILL l. c. the Borneo plant, described by him as *Oreomyrrhis borneënsis* „approaches distinctly a New Zealand form from Awatere, distributed by H. A. Travers as *Oreomyrrhis andicola* Endl. forma *tenuifolia.* It differs radically from this form, however, in its very long petioles; in its peduncles being shorter than the petioles, the New Zealand form having the peduncles longer than the leaves; in its very short pedicels and its cinereous-hirsute, not glabrous fruit." From the materials of *O. andicola,* examined by me in the Kew Herbarium, appears that none of the distinctive characters enumerated by MERRILL for his *O. borneënsis* can be hold upright. There is a New Zealand form of *O. andicola,* described by HOOKER as *O. Colensoi,* entirely agreeing with *O. borneënsis,* with exception of the length of the pedicels and the indumentum of the fruit, and also in the Andes there occur forms (*e. g.* SPRUCE 5797) that have the peduncles shorter than the leaves and the petioles longer than the lamina. The other organs, on the characters of which are based *O. borneensis,* are so variable in *O. andicola,* that the former cannot be separated from the latter as a species. Hirsute fruit are found in specimens distributed by TRAVERS, s.n., from New Zealand, South Island, Mt. Torlesse, 900 and 1050 m el., moreover in the form described by HOOKER as *O. Haastii,* and in specimens from Bolivia and Tasmania that are entirely white-tomentose; but between tomentose and glabrous plants there are found all intermediates. Sessile or short-pedicelled fruit are found in the form described by HOOKER as *O. Haastii.* For all these reasons I must consider *O. borneënsis* as a form of *O. andicola.*

The plant described by RIDLEY as *O. pumila,* from New Guinea, I must consider as a dwarf form of *O. andicola.* It is 1.5—5 cm high, the leaves agree in shape with that of the Borneo plant, but are smaller and less deeply divided, whereas the pedicels grow out when fruit-bearing, and the fruit are glabrous.

As already remarked, *O. andicola* is very polymorphic. It is glabrous to white-tomentose. Its height varies from 1.5—50 cm. The rosettes are dense or loose and from them arise simple umbels or slightly branched stems with few leaves and several umbels, arranged again nearly in an umbel. The leaves are bi-tri-pennate, rarely simply pennate with pennately divided leaflets; their petiole is shorter or longer than the lamina.

BORNEO. Mt. Kinabalu, CLEMENS s.n. (B); among shrubs near the top at Donkey's Ears and foot of Victoria Peak, 3700—3900 m el., CLEMENS 29809 (B);

Paka Cave to Low's Peak, 4000 m el., in two crevices near the summit, CLEMENS 10622 (B, cotype of *Oreomyrrhis borneënsis* MERRILL); in crevices of ledges near the summit of Low's Peak, TOPPING 1687 (K).

NEW GUINEA. Wollaston Expedition, camps XIII—XIV, 3150—3750 m el., KLOSS s.n. (BM, type of *Oreomyrrhis pumila* RIDLEY).

2. **Oreomyrrhis papuana** BUWALDA, n. sp. — **Fig. 5.** — Herba, probabiliter perennis. Radix primaria fusiformis, caudice simplici vel ramis nonnullis erectis rosulas ferentibus. Folia ad 18 cm longa; vagina 1—4 cm longa, parte inferiore ad 5 mm lata, sensim in petiolum attenuata, margine vix membranacea, omnis glabra; petiolus 4—12 cm longus, canaliculatus, subglaber, prope laminam setis paucis subhirsutus; lamina circuitu rhomboideo-ovata, 1.5—2.5 cm longa, 8—20 mm lata, subternata, foliolo terminali ternato segmentis tripartitis, foliolis lateralibus tripartitis, segmentis omnibus lanceolato-cuneatis, crasse coriacea, margine crasso et nervorum facie inferiore setis antrorsis. Inflorescentiae umbellae simplices singulae; pedunculus 12—33 mm longus, teres, leviter sulcatus, c. 1 mm crassus, parte inferiore subglaber vel setulis minimis retrorsis scabriusculus, apicem versus setis retrorsis appressis dense vestitus, scaber; involucrum compositum e bracteis 6—9 oblongo-spathulatis, basi latis, 5—8 mm longis, 1—2 mm latis, textura et indumento ut in foliorum laciniis, primum erectis, postea reflexis; pedicelli 15—30, tempore florendi brevissimi, postea excrescentes, exteriores ad 5 mm longi, interiores breviores, setulis brevibus retrorsis appressis scabri. Calycis dentes nulli; petala 1—1.25 mm longa, c. 0.75 mm lata, oblongo-ovata vel oblongo-obovata; filamenta c. 0.5 mm longa, antherae c. 0.25 mm longae, 0.2 mm latae; styli c. 0.25 mm longi. Fructus ovato-oblongus, 4—6 mm longus, c. 0.75 mm latus, 1.25 mm crassus; mericarpia jugis 5 prominentibus obtusis, intus sulcata, glaberrima; stylopodium biconicum, basi bis 0.25 mm latum, 0.6 mm altum, apicibus 2 conicis obtusis paulum excurvatis; carpophorum

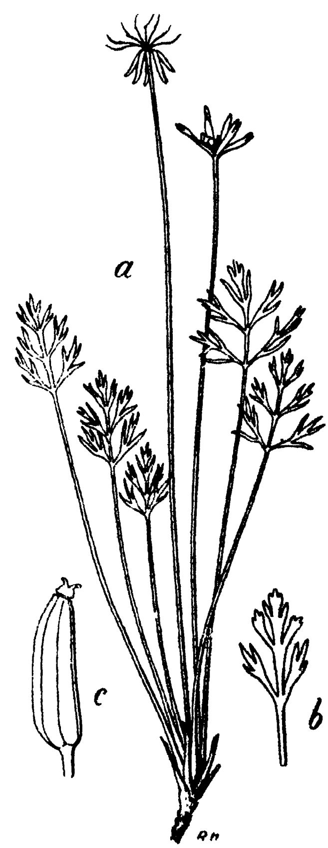

Fig. 5. — *Oreomyrrhis papuana; a*: plant, after LAM 1674, $^2/_3$ ×; *b*: leaf, after LAM 1694, $^2/_3$ ×; *c*: fruit, after LAM 1674, 4 ×.

integrum subulatum glaberrimum. (Description after the materials mentioned. In the remnants of fruit-bearing inflorescences of the last vegetation period, the carpophores are sometimes split at the tip and moreover appear hirsute, probably by a fungus.)

Oreomyrrhis papuana BUWALDA, ex VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934) nomen.

Oreomyrrhis papuana is closely related to *O. andicola,* and the only differences are those in the leaf shape, mentioned in the determination key. As the leaf shape is extremely variable in *O. andicola,* it seems questionable whether *O. papuana* is not one of the forms of *O. andicola.* Among the materials of the Kew Herbarium I did not succeed, however, in finding any form showing a leaf shape similar to that of our new species.

NEW GUINEA. Doorman Top, 3500 m el., in an open swampy ravine near the summit, LAM 1694 (B, type, also alcohol materials), leaves green, petioles sometimes red towards the base, peduncle with green base and with violet hue towards the apex, involucre dark green, pedicels green, corolla dark violet, calyx green, somewhat violet, filaments violet, anthers brownish green, slightly violet, ovary green; foot of Doorman top, 3200 m el., LAM 1674 (B, alcohol materials only).

3. **Oreomyrrhis linearis** HEMSLEY — Perennial herb, cespitose. Roots probably numerous, 1—3 mm thick above, with fibrous branches. Caudex with numerous erect branches, very variable in length, up to 12 cm long, beset with fibrous leaf rudiments, bearing dense or lax rosettes at the extremities. Leaves 2—20 cm long, always with distinct sheath and petiole, with or without broader lamina; sheath 5—35 mm long, 1—4.5 mm broad, with a 0.5 mm broad yellowish margin, tapering into the petiole; petiole difficultly to be distinguished from the lamina, together with the latter forming a narrowly spathulate to entirely linear whole, the petiole 0.75—1 mm broad, if distinguishable, 0.5—7 cm long, the lamina as broad as the petiole or up to 5 mm broad below the dentate apical portion, in narrow leaves with one tooth on each side close to the apex, in broader leaves with 2—4 teeth on each side that are 1—4 mm long, up to 2 mm broad, the largest ones often with a lateral tooth; leaf margin thickened, in narrow leaves moreover revolute, usually finely retrorsely ciliate; upper and lower surface usually glabrous or the upper surface retrorsely appressedly hirsute; nervation pennate with strongly ascending lateral nerves in broader leaves, hardly visible above; main nerve and thickest lateral nerves strongly prominent beneath, finer nerves slightly prominent or indistinct. Peduncles one or several in each rosette, 6—30 cm long, erect or somewhat curved, leafless or rarely with one leaf, triangular with somewhat thickened angles, retrorsely hir-

sute towards the apex with appressed whitish bristles up to 0.5 mm long, often entirely glabrous later; involucral bracts 5—6 in number, lingulate, obtuse, 2—5 mm long, 0.5—1.25 mm broad, connate at the base, glabrous towards the apex, retrorsely hirsute towards the base; flowers 6—8 in each umbel, pedicels of the outer flowers to 1.5 mm long, the inner flowers sessile, lengthening later; fruit-bearing pedicels 2.5—10 mm long, densely retrorsely hirsute. Ovary nearly 1.75 mm long, 0.75 mm broad; calyx teeth none; petals triangular, 1.1—1.2 mm long, 0.8 mm broad, violet; filaments to 0.7 mm long, violet; anthers nearly 0.4 mm long, 0.25 mm broad, fixed in the middle, opening laterally; styles nearly 0.5 mm long, slightly curved outward. Fruit to 5 mm long, oblong-ovate, slightly curved, attenuate towards the apex, nearly 1 mm broad, 1.5 mm thick, the mericarps with 5 prominent, 0.2 mm high, obtuse ribs, grooved inside, entirely glabrous; stylopodium low-conical, 2-partite; carpophore split down to the base. (Description after the plants collected by BRASS.)

Oreomyrrhis linearis HEMSLEY, in HOOK., Ic. pl., 26, t. 2590 (1899); VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 255 (1934).

Oreomyrrhis linearis was only known, hitherto, from the originals collected by GIULIANETTI and described by HEMSLEY. The rather abundant materials, collected by BRASS, and upon which the above description is based, give a better idea of the polymorphy. There are small specimens (BRASS 4307) of which the caudices are short and crowded, the rosettes very many-leaved and dense, the leaves entirely linear from the sheath upwards, only 2.5—7 cm long, 1 mm broad, the two teeth so closely near the apex that the leaf appears quite entire at first sight, the peduncles nearly twice as long as the leaves. These specimens look like a form of open sunny locality, and indeed the label mentions their growing „amongst summit rocks". Other specimens (BRASS 4404) are partly like the above described, partly more slender, the leaves to 20 cm long, to 1.5 mm broad below the apical portion, the 3 teeth more distinct, the peduncles less than twice as long as the leaves, now and then even shorter than the leaves; they have been collected on „open grassland". The number BRASS 4358 has leaves not longer, but broader, to 4.5 mm broad under the apex, the teeth more numerous, to 3 on both sides, and more distinct, the lower ones to 3 mm long and 1.75 mm broad, here and there again bearing a tooth at the outside; these specimens are from „sheltered high mountain grassland". The number BRASS 4753 is like the preceding, but the plants are longer, the leaves to 18 cm, the peduncles to 30 cm long; it has been collected on „grassy creek banks

on open country". The number BRASS 5682 is one small plant with short but broad leaves, bearing to 4 teeth at each side, that often again bear a tooth; it has been collected on „open grassland". The originals collected by GIULIANETTI are between the numbers BRASS 4404 and 4358.

NEW GUINEA. S.E. part (Papua), Central Division, Mt. Albert Edward, 3680 m el., BRASS 4358 (NY), common, sheltered high mountain grasslands, leaves erect, flowers purple-red; BRASS 4404 (NY), tufted on open grasslands, common, flowers purple-red; BRASS 5682 (NY), open grasslands; 3986 m el., BRASS 4307 (NY), common amongst summit rocks, flowers and fruit purple; Wharton Range, Murray Pass, 2840 m el., BRASS 4753 (NY), common, grassy creek banks on open country; Mount Scratchley, 3000—3900 m el., GIULIANETTI s.n. (K); Wharton Range, 3330 m el., GIULIANETTI s.n. (K).

X. CUMINUM

LINN., Sp. pl., ed. 1 (1753) 1, p. 254; Gen. pl., ed. 5 (1754) p. 121; BENTHAM & HOOKER FIL., Gen. pl., 1, p. 926 (1867); CLARKE, in HOOK. FIL., Fl. Br. Ind., 2, p. 717 (1879); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 184 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1138 (1926).

Only species:

1. **Cuminum Cyminum** LINN. — Annual herb. Stem 15—50 cm high, erect, strongly branched from the base with divergent branches, terete, striate, entirely glabrous. Leaves short-petioled or sessile upon a sheath to 1 cm long and 0.5 mm broad, with a membranous white margin, auriculate at the apex or tapering into the petiole; lamina 3—10 cm long, bipennate, the segments linear, to 1.5 mm broad. Inflorescences compound umbels opposite to the leaves, or terminal; peduncle 2—4 cm long; involucral bracts 3 to 5 in number, 2—3.5 cm long, tripartite or twice tripartite, with filiformous segments, sessile upon a 0.5 cm long sheeth with membranous white margin; umbel rays 4 to 6 in number, 1—1.5 cm long; bracts of the involucels 2 to 4 in number, to 9 mm long, white-membranous at the margin; pedicels 3 to 7 in number, 4—5 mm long. Calyx teeth 1—1.5 mm long, linear to subulate, persistent; petals nearly 1 mm long by 0.5 mm broad, obcordate with inflexed tip. Mericarpia 5—7 mm long, nearly 3 mm broad, somewhat laterally flattened, with 5 filiformous bristly main ribs, and with a stellate-hairy line in the vallecules. (Description after plants from the Orient in the Kew Herbarium.)

Cuminum Cyminum LINN., Sp. pl., ed. 1 (1753) 1, p. 254; D.C., Prodr., 4 (1830) p. 201; ROXBURGH, Fl. Ind., ed. CAREY (1832) 2, p. 92;

WIGHT & ARN., Prodr. (1834) p. 373; HIERN, in Fl. Trop. Afr., 3 (1871) p. 3; ROXBURGH, Fl. ind., ed. 3 (1874) p. 271; FILET, Plantk. Woordenb. (1876) p. 89; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 718 (1879); BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 211; KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 184 (1898); DE CLERCQ, Plantk. Woordenb. (1909) p. 213; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 726; WIGMAN, in VAN GORKUM, O.I. Cultures, 2, p. 883 (1913); VAN DONGEN, Overz. Geneesm. Ned. Ind. (1913) p. 130; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 397; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1138, ic. 2424, 2425 (1926); HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1212; OCHSE & BAKHUIZEN, Ind. groenten (1931) p. 706, ic. 429; BURKILL, Dict. Econ. Prod. Mal. Pen. (1935) 1, p. 701.

JAVA, cultivated according to BISSCHOP GREVELINK, KOORDERS, WIGMAN, HEYNE, OCHSE, ll. cc.

Distribution: indigenous in Turkestan, cultivated in all parts of the world.

XI. APIUM.

LINN., Sp. pl., ed. 1 (1753) 1, p. 264; Gen. pl., ed. 5 (1754) p. 128; BENTHAM, Fl. austr., 3 (1866) p. 371; BENTHAM & HOOK.F., Gen. pl., 1, p. 888 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 678 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 616; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 184 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1139 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90, p. 26, 358 (1927).

Key to the species.

Leaves pennate, with broad 3-partite to 3-lobate petiolulate leaflets . . . **1. A. graveolens**

Leaves bi- to tripennate, with very narrow or filiformous segments . . . . **2. A. tenuifolium**

1. **Apium graveolens** LINN. — Annual or biennial herb. Primary root fusiformous or tuberiformous. Stems 25—90 cm high, angular, striate and grooved. Petioles rather long with a white-margined, rather short sheath up to 2 cm long in the lower leaves; lamina pennate with leaflets 2—2.5 cm long up to 3 cm broad, 3-lobate to 3-partite, petiolulate, in the upper leaves smaller, ternate to 3-partite. Compound umbels opposite to the leaves; peduncle 0—2 cm long; rays 10—15 in number, 1—3 cm long; pedicels 6—10 in number, 2—3 mm long; involucre and involucels none. Calyx teeth none; petals white or greenish, 0.5 mm long and broad, with inflexed tip. Mericarps 1 mm long, up to 0.75 mm

broad, with all ribs very narrowly winged; stylopodium nearly 0.25 mm high, the halves conical; carpophore emarginate at the tip.

Apium graveolens LINN., Sp. pl., ed. 1 (1753) 1, p. 264; D. C., Prodr., 4 (1830) p. 101; WIGHT & ARN., Prodr. (1834) p. 367; HASSKARL, Cat. Pl. Hort. Bot. Bogor. (1844) p. 163, cum var. *rapaceo*; MIQUEL, Fl. Ind. Bat., I, 1, p. 737 (1856); TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 165; HIERN, in Fl. Trop. Afr., 3 (1871) p. 11; FILET, Plantk. Woordenb. (1876) p. 305; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 679 (1879); BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 206; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 617; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 185, ic. 64, D—E (1898); KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; MATSUMURA & HAYATA, Enum. pl. Formos. (1906) p. 171; DE CLERCQ, Plantk. Woordenb. (1909) p. 170; KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228, p. 98 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 726; HAYATA, Ic. pl. Formos., 2 (1912) p. 52; WIGMAN, in VAN GORKUM, O.I. Cultures, 3 (1913) p. 691; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 397; CHERMEZON, in LECOMTE, Fl. Indo-Ch., 2, p. 1143, ic. 135, 11—13 (1923); OCHSE, Trop. groenten (1925), p. 185 cum ic. p. 186; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1142, ic. 2426—2428, 2430, i, 2434, g—i, t. 195, 5 (1926); WOLFF, in ENGLER, Pflanzenr., IV, 228, Heft 90, p. 28 (1927); HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1213; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. 3, suppl. 1 (1930) p. 24; EWART, Fl. Victoria (1930) p. 907; OCHSE & BAKHUIZEN, Ind. groenten (1931) p. 697, ic. 424; CRAIB, Fl. siam. enum., 1, p. 788 (1931); BURKILL, Diction. Econ. Prod. Mal. Pen., 1 (1935) p. 192.

SUMATRA. Cultivated at Berastagi and Pamatang Siantar, brought on the market at Médan and probably also exported to Penang and Singapore (after oral communication by Prof. J. KUYPER, Groningen); sold on the market at Palembang (MIQUEL, Fl. Ind. Bat., suppl. Sumatra, p. 52, 1860).

JAVA. Sold during the whole year by the Sundanese at Buitenzorg, from mountain cultures, now and then even planted in their gardens by the European (after oral communication by Prof. B. H. DANSER, Groningen); cultivated E. of Tjibodas, HEYNING, in Teysmannia, 13, p. 87 (1902); Tjipanas, Tjibodas, Tjimatjan, Tjihandjawar, up to 1500 m el., and even higher, Kandangsapi, Kemang, and other localities between Tjipanas and Tjibodas on G. Gedé, 1000—1400 m el., DE BIE, in Pemimpin Pengoesaha Tanah, I, 9—10, p. 60—67 (1915); Pengalengan, cultivated, WARBURG 3121 (BD); Semarang, from the mountains, MULLER, in Nat. & Geneesk. Arch. Ned. Ind., 2, p. 465 (1845); Diëng Plateau, 2100 m el., cultivated in a native garden, BACKER 21874 (B); Ngadisari, 2000 m el., KOORDERS 38092 β (B), cultivated, v.n.: *seledri*.

Distribution: indigenous in the temperate parts of Europe, Africa, and Asia, also in S. America, cultivated elsewhere (THELLUNG, WOLFF ll. cc.).

2. **Apium tenuifolium** (MOENCH) THELLUNG — Annual herb. Primary root fusiformous. Stems 40—50 cm high, striate, nearly glabrous. Leaves bi- to tri-pennate with nearly filiformous 0.5—1 mm broad segments. Inflorescences opposite to the leaves; peduncle 0—2 cm long; umbel rays 3—5 in number, 0.5—1 cm long; pedicels 5—10 in number, 2—4 cm long; involucre and involucels none. Calyx teeth none; petals white, nearly 0.4—0.6 mm long, 0.2 mm broad the strongly inflexed tip excluded. Mericarps nearly 1.5 mm long, 0.5 mm broad, with obtusely keeled ribs. Stylopodium finally bipartite, the halves small, conical; carpophore bipartite at the apex down to about one-seventh of its length. (Description after the materials under mentioned.)

Sison Ammi (non LINN. 1753) JACQUIN, Hort. Vindob., t. 200 (1773) excl. synon., ex THELL., in HEGI, l. c.; *Cnidium tenuifolium* MOENCH, Meth. (1794) p. 98, excl. synon; *Pimpinella leptophylla* PERSOON, Synops., 1 (1805) p. 324; *Helosciadium leptophyllum* D. C., Mem. Soc. Phys. Genève, 4, p. 493 (1828); Prodr., 4 (1830) p. 105; *Apium leptophyllum* BENTHAM, Fl. austr., 3 (1866) p. 372; BAILEY, Queensl. Fl., 2 (1900) p. 724; Compr. Cat. Queensl. Pl. (1913) p. 229; SPRAGUE, in Journ. Bot., 61 (1923) p. 129; ALSTON, in TRIMEN, Handb. Fl. Ceylon, 6 (1931) p. 138; *Apium Ammi* URBAN, in MART., Fl. bras., XI, 1, p. 341, t. 91 (1879); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 185 (1898); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 53, 361; EWART, Fl. Victoria (1930) p. 907; *Apium tenuifolium* THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1140 (1926).

MALAY PENINSULA. P. Pinang, Pinang Hill Garden, weed, RIDLEY 10248 (S); Government Hill, 750 m el., CURTIS 3407 (S) introduced; 720 m el., BURKILL 761 (S).

JAVA. Buitenzorg, WARBURG 1688, after WOLFF l. c.; Trètès, after communication by Dr. C. A. BACKER.

NEW GUINEA. WOLFF, l. c.

Distribution: Central & Southern America, Australia, New Zealand, cultivated or adventicious in Europe & Asia (THELLUNG, WOLFF, SPRAGUE, ll. cc.).

XII. PETROSELINUM

HILL, Brit. Herbal (1756) p. 424; HOFFMANN, Gen. pl. Umbellifer. (1814) p. 78, t. I, 7; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 186 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1154 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 63; *Carum* sect. *Petroselinum* BENTH. & HOOK.F., Gen. pl., 1, p. 891 (1879).

Only species:

1. **Petroselinum vulgare** HILL — Biennial herb. Stems 25—100 cm high, erect, grooved. Lower leaves to tripennate, with obovate to cuneate tripartite leaflets; upper leaves ternate. Inflorescences terminal and axillary; peduncle 2—12 cm long; umbel rays 5—10 in number, 1—3 cm long; pedicels 3—15 in each umbellule, 2—5 mm long; involucre 1—3-leaved, involucels 3—8-leaved. Calyx teeth none; petals greenish-yellow, nearly 1 mm long, 0.5 mm broad, with inflexed tip. Mericarps 2—2.5 mm long, nearly 1 mm broad, their ribs filiformous. (Description after European and Javan plants.)

Apium Petroselinum LINN., Sp. pl., ed. 1 (1753) 1, p. 264; HOUTTUYN, Nat. Hist., II, 8 (1777) p. 227; BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 206; *Petroselinum vulgare* HILL, Brit. Herbal (1756) p. 424, ic. p. 60; DRUCE, in Rep. Bot. Exch. Club Brit. Isl., 3, p. 439 (1913); OCHSE & BAKHUIZEN, Ind. groenten (1931) p. 717, ic. 435; BURKILL, Dict. Econ. Prod. Mal. Penins. (1935) 1, p. 1699; *Petroselinum hortense* HOFFMANN, Gen. pl. Umbellifer. (1814) p. 163, t. I, 7; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1155, ic. 2433, 2434, a—f, 2435a—2437, t. 196, 2 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 63; *Petroselinum sativum* HOFFMANN, Gen. pl. Umbellifer. (1814) p. 177; D. C., Prodr., 4 (1830) p. 102; HASSKARL, Cat. Pl. Hort. Bot. Bogor. (1844) p. 163; MIQUEL, Fl. Ind. Bat., I, 1, p. 737 (1856); TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 165; BENTHAM, Fl. austr. 3 (1866) p. 336; MASSART, in Mém. Soc. Roy. Bot. Belg., 34, p. 203, 335 (1895); KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; DRUDE, in ENGLER & PRANTL, Nat. Pflanzenfam., III, 8, p. 186 (1898); KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228, p. 98 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 726; WIGMAN, in VAN GORKUM, O. Ind. Cult., 3, p. 685 (1913); HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 398; OCHSE, Trop. groenten (1925) p. 191, ic. p. 192; HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1213; *Carum Petroselinum* BENTH. & HOOK.F., Gen. pl., 1, p. 891 (1867); EWART, Fl. Victoria (1930) p. 906; *Petroselinum Petroselinum* KARSTEN, Fl. Deutschl. 2, p. 394 (1895).

SUMATRA. Cultivated near Berastagi and Pamatang Siantar, brought on the market in Médan (after oral communication by Prof. J. KUYPER, Groningen).

JAVA. Batavia, cultivated, HEYNE s.n. (B, L); Meester Cornelis, 30 m el., cultivated, BACKER 21041 (B); Tjianten, S. of Leuwiliang, nr. Buitenzorg, 900 m el., cultivated, BACKER 25676 (B); Semarang, brought from the mountains (MULLER, in Nat. & Geneesk. Arch., 2, p. 465, 1845); Ngadisari, 2000 m el., KOORDERS 38091 β (B), cultivated, v.n.: *potroseli*.

Distribution: indigenous in South Europe and North Africa, cultivated and subspontaneous elsewhere (THELLUNG, WOLFF, ll. cc.).

XIII. TRACHYSPERMUM

LINK, Enum. Hort. Berol., 1 (1821) p. 267; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 188 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1167 (1926); WOLFF, in ENGLER, Pflanzenr., IV, 228, Heft 90, p. 87 (1927); *Carum* sect. *Trachyspermum* BENTH. & HOOK.F., Gen. pl., 1, p. 891 (1867).

Key to the species.

Leaves 2—3-pennatisect, the ultimate segments of the lower leaves to 1 mm broad. Calyx teeth distinct. Fruit with broad, roundish scale-like hairs
1. T. Ammi

Leaves 2-pennatisect, ultimate segments of the lower leaves more than 2 mm broad. Calyx teeth obsolete. Fruit with narrow obtuse nipple-shaped hairs
2. T. Roxburghianum

1. **Trachyspermum Ammi** (LINN.) SPRAGUE — Annual herb. Stems 25—45 cm high, striate, glabrous, usually strongly branched. Leaves 2—3-pennate, the ultimate segments narrow-oblong, to 1 mm broad. Inflorescences terminal or seemingly lateral; peduncle 1—6.5 cm long; umbel rays 5—9 in number, 0.5—1 cm long, to 2 cm long when fruitbearing; pedicels 4—15 in number, 1—6 mm long; involucre with 3—5 oblong, sometimes divided bracts, involucels of 4—5 oblong bracts, the bracts of both very unequal in length, hirsute, with membranous margin. Calyx teeth distinct, nearly 0.2 mm long, thickly subulate. Petals 0.6—0.7 mm long and broad, obcordate, with inflexed tip. Fruit to 2 mm long, 1 mm broad, with broad scale-like hairs especially along the ribs. (Description after specimens in the Buitenzorg Herbarium, cultivated by Mr. HEYNE in his garden.)

Sison Ammi LINN., Sp. pl., ed. 1 (1753) p. 252; *Ammi copticum* LINN., Mantissa 1 (1767) p. 56; *Ligusticum ajouan* ROXBURGH, Hort. bengal. (1814) p. 21, nomen; *Ligusticum ajowan* ROXBURGH, Fl. ind., ed. CAREY, 2 (1832) p. 91; ed. 3 (1874) p. 271; *Trachyspermum copticum* LINK, Enum. Hort. Berol., 1 (1821) p. 267; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1167 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 87, 364; *Ptychotis coptica* D. C., in Mém. Soc. Phys. Genève, 4, p. 496 (1828); Prodr., 4 (1830) p. 108; *Ptychotis Ajowan* D. C., in Mém. Soc. Phys. Genève, 4, p. 497 (1828); Prodr., 4 (1830) p. 109; WIGHT & ARN., Prodr. (1834) p. 368; WIGHT, Ic. pl., t. 566 (1843); MIQUEL, Fl. Ind. Bat., I, 1, p. 737 (1856); *Carum copticum* HIERN, in Fl. Trop. Afr., 3 (1871) p. 12; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 682 (1879) excl. syn.; BOERLAGE, Handl. Fl. Ned. Ind., I, 2

(1890) p. 618; TREUB, in Teysmannia, 10, p. 73, 74 (1900); VAN DONGEN, Overz. geneesm. Ned. Ind. (1913) p. 129; HEYNE, Nutt. pl. Ned. Ind., ed. 1, 3 (1917) p. 398; MERRILL, Interpr. Rumph. Herb. Amb. (1917) p. 411; Enum. Phil. Fl. Pl., 3, p. 238 (1923); HEYNE, Nutt. pl. Ned. Ind., ed. 2 (1927) 2, p. 1214; *Trachyspermum Ammi* SPRAGUE, in Kew. Bull. (1929) p. 228; BURKILL, Diction. Econ. Prod. Mal. Pen., 2, p. 2171 (1935).

JAVA, formerly cultivated, according to HEYNE l. c.

Distribution: indigenous and cultivated in Egypt, Abyssinia, S.W. Asia to E. India, subspontaneous in Europe (THELLUNG, WOLFF, ll. cc.).

2. **Trachyspermum Roxburghianum** (D. C.) CRAIB — Annual herb. Stems 15—90 cm high, striate, nearly glabrous, usually strongly branched. Leaves pennate with the leaflets pennatifid to pennatipartite, the extreme segments of the lower leaves to 3 mm broad, those of the upper leaves gradually narrower, those of the uppermost leaves very narrow, sometimes nearly filiformous. Inflorescences terminal and axillary; peduncle 2—8 cm long, rays 2—6 in number, 1—2.5 cm long; pedicels 5—15 in each umbellule, 2—6 mm long; involucres 2—5-leaved, involucels 5—8-leaved, both with very narrow and finely ciliate bracts. Calyx teeth indistinct, hardly 0.1 mm long; petals nearly 1.25 mm long, 0.75 mm broad, obcordate with inflexed tip. Mericarps oblong, nearly 2.5 mm long, 0.75 mm broad, whole fruit with very short obtuse spreading hairs. (Description after the materials under mentioned.)

Apium involucratum ROXBURGH, ex FLEM., Ind. Med. Pl., in As. Research, 11, p. 157 (1810); WIGHT, Ic. pl., II, t. 567 (1843); *Ptychotis Roxburghiana* D. C., Prodr., 4 (1830) p. 109; MIQUEL, Fl. Ind. Bat., I, 1, p. 737 (1856); *Ptychotis involucrata* ROYLE, Ill. bot. Himal., 1, p. 229 (1839); *Carum Roxburghianum* KURZ, in Journ. As. Soc. Beng., 46, II, p. 114 (1877); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 682 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 618; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3, p. 399 (1917); CHERMEZON, in LEC., Fl. Indo-Ch., 2, p. 1144, ic. 135, 14—16 (1923); HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1214; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. III, suppl. 1 (1930) p. 59; *Carum involucratum* MERRILL, Enum. Phil. Fl. Pl., 3, p. 239 (1923); OCHSE & BAKH., Ind. groenten (1931) p. 700, ic. 425; *Trachyspermum involucratum* (non MAIRE 1922) WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 89; *Trachyspermum Roxburghianum* WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 129, errore; CRAIB, Fl. siam. enum., 1, p. 788 (1931); BURKILL, Diction. Econ. Prod. Mal. Pen., 2, p. 2172 (1935).

MALAY PENINSULA. Selangor, CANTLEY's coll. s.n. (S); Singapore, MIQUEL, l. c.

SUMATRA. Atjèh, Kong Boer, Gajoloeëus, PRINGGO ATMODJO (exp. VAN DAALEN) 199 (B, L), v.n.: *renggiroeng*; Sibolangit, 500 m el., LÖRZING 4216 (B), supspontaneous; G. Kerintji, Sumatra Expedition 1877—1878 (B); N. foot of G. Pakiwang, 500 m el., W. side Danau Rana, VAN STEENIS 3836 (B), cultivated in ladang; Moearadoea, 250 m el., GRASHOFF 395, 446 (B, L), v.n.: *adas, djintoa.*

JAVA. Batavia, E. of Loeloet, 400 m el., VAN SLOOTEN 600 (B); Buitenzorg, 250 m el., BAKHUIZEN VAN DEN BRINK 6801 (B, L, S, U) cultivated, v.n.: *soeragè*; Kalapanoenggal, nr. Buitenzorg, HEYNE s.n. (B, BD, L, S, U) cultivated; Tjileungsi and Kalapanoenggal, ex HEYNE l. c.; Si Boentoe nr. Kalapanoenggal, 200—300 m el., BACKER 5842 (B, L), cultivated, v.n.: *soeragé*; Tjibaroesa nr. Buitenzorg, VORDERMAN s.n. (B) cultivated; Tjiterep nr. Buitenzorg, ARSIN s.n. (B, L); Boerangrang, Wanajasa, 650 m el., BACKER 14239 (B), cultivated, v.n.: *parmesèli*; Tegal, 5 m el., BACKER 15447 (B) cultivated, v.n.: *pitersili, pletikapoe*; Bandjarnegara, 270 m el., BACKER 22042 (B) cultivated; Djogjakarta, JUNGHUHN s.n. (L), cultivated; Madioen, 60 m el., WISSE 64 (B); Pasoeroean, 4 m el., BACKER 24166 (B, L) and BACKER s.n. (Pa), cultivated; Bandawasa, 250 m el., BACKER 9495 (B).

MADOERA. Ketapangdaja, 1 m el., BACKER 19822 (B), cultivated, v.n.: *terseli*; Pamekasan, 15 m el., BACKER 20289 (B), v.n.: *perséli.*

LETI, nr. Timor. TREUB 466 (B, L).

HALMAHERA. Galèla, 10 m el., BEGUIN 1781 (B, L), v.n.: *sorowai.*

BATJAN. WARBURG 18114 (BD).

SERAN. Sannoeloe, sea level, KORNASSI 640 (B, L, U).

NEW GUINEA. Merauke, VERSTEEG 1847 (B).

Distribution: of unknown provenance, now cultivated and subspontaneous in tropical S.E. Asia (WOLFF l. c.).

XIV. CRYPTOTAENIA

D. C., Mém. Ombellif. (1829) p. 42; Prodr., 4 (1830) p. 118; BENTH. & HOOK.F., Gen. pl., 1, p. 896 (1867); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 189, 271 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1169 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 111.

Only species:

1. **Cryptotaenia canadensis** (LINN.) D. C. — Perennial herb. Rhizome 1—2 cm long, up to 1 cm thick, chambered. Stems erect, up to 90 cm high, terete, striate. Lower petioles up to 10 cm long, the upper ones gradually shorter, sheaths auriculate at the apex and with membranous margin; lamina ternate, with sessile or short-petiolulate ovate to rhomboidal irregularly biserrate to bidentate leaflets, the lateral ones often bifid to bipartite. Compound umbels terminal on the stems and the branches, united into leafy panicles; peduncles 1—8 cm long; rays 5—7 in number, 3—50 cm long, those of one umbel very different in

length; pedicels of each umbellule 6—10 in number, 1.5—15 mm long, those of one umbellule very different in length; involucres none or with one or two 4 mm long subulate leaves; involucels with 2—5 to 1 mm long subulate leaves. Calyx none during flowering, short on the fruit. Petals white, nearly 1 mm long, 0.5—0.75 mm broad, obcordate with inflexed apex. Mericarps 4—6 mm long, 1.5 mm broad, oblong-ellipsoidal, attenuate towards both ends, somewhat laterally compressed, distinctly ribbed; stylopodium coniformous, bipartite, the halves together with the styles forming nearly 0.75 mm long beaks on the mericarps. (Description after specimens cultivated in the Buitenzorg and Groningen Botanic Gardens.)

Sison canadense LINN., Sp. pl., ed. 1 (1753) 1, p. 252; *Cryptotaenia canadensis* D. C., Prodr., 4 (1830) p. 119; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 189 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1169, ic. 2442 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 111; BAKKUS, in Bull. Jard. Bot. Buitenz., sér. III, suppl. 1 (1930) p. 87; OCHSE & BAKHUIZEN, Ind. groenten (1931) p. 705, ic. 428; *Cryptotaenia japonica* HASSKARL, Retzia, 1, p. 113 (1855); TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 166.

JAVA. Cultivated by the Japanese according to OCHSE and BAKHUIZEN l. c.

Distribution: indigenous in eastern N. America, China and Japan (THELLUNG and WOLFF, ll. cc.).

XV. CARUM

LINN., Sp. pl., ed. 1 (1753) 1, p. 263; Gen. pl., ed. 5 (1754) p. 127; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 617, p.p.; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 191 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1181 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 143; *Carum* sect. *Carvi* BENTH. & HOOK.F., Gen. pl., 1, p. 890 (1867).

Only species:

1. **Carum Carvi** LINN. — Biennial herb. Stems to 55 cm high, erect, terete, striate. Lower petioles to 13 cm long, upper ones gradually shorter, uppermost ones none, all of them with a sheath with membranous margin and auriculate apex; lamina oblong, to 13 cm long 5 cm broad, bipennate with divided segments. Compound umbels terminal to the stems and the branches; peduncles 1—11 cm long; involucres none or of one subulate leaf; involucels none; rays 5—8 in number, 0.5—2 cm long; pedicels 1.5—5 mm when flower-bearing, up to 9 mm when fruit-bearing, 6—14 in each umbellule. Calyx teeth none; petals white or

reddish, to 1.25 mm long, nearly 1 mm broad, obcordate with short inflexed tip. Mericarps 4—5 mm long, up to 1 mm broad, often falcate, with distinct yellowish ribs. Stylopodium bipartite, the halves low-conical. (Description after European materials.)

Carum Carvi LINN., Sp. pl., ed. 1 (1753) 1, p. 263; D. C., Prodr., 4 (1830) p. 115; MIQUEL, Fl. Ind. Bat., I, 1, p. 737 (1856); HIERN, in Fl. Trop. Afr., 3 (1871) p. 12; FILET, Plantk. Woordenb. (1876) p. 89; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 680 (1879); BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 206; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 618; KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 192 (1898); DE CLERCQ, Plantk. Woordenb. (1909) p. 195; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 726; VAN DONGEN, Overz. Geneesm. Ned. Ind. (1913) p. 129; THELLUNG, in HEGI, Ill. Fl. -Mitteleur., V, 2, p. 1182, ic. 2448—2449, t. 197, 1a—c (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 145; BURKILL, Diction. Econ. Prod. Mal. Penins. (1935) 1, p. 468.

JAVA. Cultivated, according to MIQUEL and KOORDERS, ll. cc.; cultivated near Tosari after oral communication by Prof. J. KUYPER, Groningen.

Distribution: indigenous in Europe and temperate Asia, cultivated elsewhere. (THELLUNG, WOLFF, l. c.).

XVI. PIMPINELLA

LINN., Sp. pl., ed. 1 (1753) 1, p. 263; Gen. pl., ed. 5 (1754) p. 128; BENTH. & HOOK.F., Gen. pl., 1, p. 893 (1867); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 618; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 195 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1196 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 219; *Murrithia* & *Heterachaena* ZOLLINGER, in Nat. & Geneesk. Arch. Ned. Ind., 2, p. 576, 577 (1845); *Anisometros* HASSKARL, in Flora, 30, p. 602 (1847).

Key to the species.

1 Fruit densely warty. Involucre 3- to more-leaved. Lower leaves usually imparipennate . . . . **3. P. pruatjan**

Fruit hairy. Involucre 1—2-leaved. Lower leaves mostly simple. . . . 2

2 Lower and middle leaves simple, with serrate margin, not lobed. Umbel rays 20—30 . . . . **2. P. javana**

Lower leaves orbicular to reniformous, often crenate, sometimes lobate, middle leaves ternate to pennate with incised leaflets. Umbel rays 8—14 . . **1. P. Anisum**

1. **Pimpinella Anisum** LINN. — Annual herb. Stems erect, terete, grooved, pubescent. Lower leaves with petioles 4—10 cm long, upper ones with petioles gradually shorter, uppermost ones sessile, all with mem-

branous-margined sheath; lower laminae crenate to cordate, serrate, the following ones successively incised, ternate and nearly pennate with dentate to incised leaflets. Compound umbels terminal to the stem and its branches; peduncles 2.5—7 cm long; involucres none or of 2 narrow 3—4 mm long leaves; rays 8—14 in number, 4—25 mm long; pedicels 7—13 in each umbellule, 1—5 mm long; involucels none or of 1 or 2 subulate 1 mm long leaves. Calyx teeth indistinct; petals nearly 1 mm long, obcordate with inflexed tip. Mericarps up to 5 mm long, 2 mm broad, ellipsoidal, attenuate towards the apex, short-hairy with antrorse hairs and distinct ribs. Stylopodium bipartite, conical. (Description after European materials.)

Pimpinella Anisum LINN., Sp. pl., ed. 1 (1753) 1, p. 264; HOUTTUYN, Nat. Hist., II, 8 (1777) p. 224; D. C., Prodr., 4 (1830) p. 122; MIQUEL, Fl. Ind. Bat., I, 1, p. 740 (1856); FILET, Plantk. Woordenb. (1876) p. 1; BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 208; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 619; DRUDE, in ENGLER & PR., Nat. Pflanzenfam., III, 8, p. 196 (1898); KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; DE CLERCQ, Plantk. Woordenb. (1909) p. 304; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 727; VAN DONGEN, Overz. Geneesm. Ned. Ind. (1913) p. 130; WIGMAN, in VAN GORKUM, O. Ind. Cult., 2 (1913) p. 883; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1209, ic. 2310a, 2456 (1926); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 232, 374; EWART, Fl. Victoria (1930) p. 908; BURKILL Diction. Econ. Prod. Mal. Pen., 2, p. 1728 (1935).

JAVA, sometimes cultivated, according to MIQUEL, KOORDERS, WIGMAN, ll. cc.
Distribution: from unknown provenance, probably from the Orient, cultivated and subspontaneous throughout the world, especially in the Mediterranean Region and in Central Europe (THELLUNG, and WOLFF, ll. cc.).

2. **Pimpinella javana** D. C. — Perennial herb. Stems erect or adscendent, usually 50—150 cm high, terete, striate, shortly and densely hairy, almost tomentose in the youth, glabrescent later. Lowes leaves nearly in a rosette, with a petiole to 10 cm long of which the lower 3—6 cm sheathy, the lamina entire, ovate in outline, deeply cordate, to 12 cm long by 10 cm broad, subobtusely to acutely serrate; upper leaves gradually smaller and shorter-petioled, more acutely serrate or even dentate, the uppermost ones bearing branches in their axils, often tripartite, all of them more or less hairy above, white-tomentose below in the youth, glabrescent later. Compound umbels united to an oblong panicle, distinctly terminal to the stem and the branches or seemingly opposite the leaves; peduncles 4—15 cm long; rays 20—30 in number,

2—4 cm long; pedicels 12—16 in each umbel, 3—8 mm long; involucre 0—4-leaved, involucels 1—4-leaved, with bracts nearly filiformous and shorter than the outer pedicels. Calyx teeth none; petals nearly 1.5 mm long by 1 mm broad, with small inflexed tip. Mericarps nearly 2 mm long, 1 mm broad, densely hairy with short spreading hairs. (Description after the materials under mentioned.)

Pimpinella javana D. C., Prodr., 4 (1830) p. 122; MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 96 (1851) cum var.s *macrophylla, sylvestri, microphylla*; MIQUEL, Fl. Ind. Bat., 1, 1, p. 738, t. 10 (1856) cum var.s *macrophylla, sylvestri, microphylla*; Ill. Fl. Arch. Ind. (1871) p. 40; FILET, Plantk. Woordenb. (1876) p. 94; BECCARI, Malesia, 1 (1877) p. 219; in Bot. Jahrb., 1, p. 29 (1881); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 618; KUNTZE, Rev. gen. pl., 1 (1891) p. 269; WIGMAN, in Teysmannia, 4, p. 740 (1893); KOORDERS, in Nat. Tijdschr. Ned. Ind., 60, p. 371 (1901); in Teysmannia, 11, p. 246 (1901); DE CLERCQ, Plantk. Woordenb. (1909) p. 304; KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228, p. 99 (1911); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 727; DOCTERS VAN LEEUWEN, in Ber. Deutsch. Bot. Gesellsch., 31, p. 152—156, t. 3 (1913); SCHMUCKER, in Beih. Bot. Centralbl., 43, 2, p. 49, 66 (1927); WOLFF, in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 267, 375, ic. 24; RANT, in Nat. Tijdschr. Ned. Ind., 89, p. 451 (1929); VAN STEENIS, in Trop. Nat., 19 (1930) p. 78, 89; DOCTERS v. L., in Verh. Kon. Akad. Wetensch. Amsterdam, afd. Natuurk., sect. 2, 31 (1933) p. 257; VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 256 (1934); *Murrithia cordata* ZOLLINGER, in Nat. & Geneesk. Arch. Ned. Ind., 2, p. 576 (1845); HASSKARL, in Flora, 30, p. 601 (1847); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 139; TEYSMANN & BINNEND., Cat. pl. Hort. Bot. Bogor. (1866) p. 166; *Pimpinella javana* var. *microphylla* JUNGHUHN, Java, ed. HASSKARL, 1, p. 432 (1857).

Pimpinella javana is closely allied to *P. Candolleana* W. & A. from the Nilgherries, the Pullney Hills, Tengyueh and Yunnan, *P. Leschenaultii* CLARKE from the Nilgherries and Ceylon, *P. pulneyensis* GAMBLE from the Pullney Hills, *P. yunnanensis* WOLFF from Yunnan, *P. cambodgiana* DE BOISSIEU from Cambodgia and Yunnan, and *P. coriacea* DE BOISSIEU, from Yunnan.

According to MOLKENBOER l. c. and MIQUEL l. c., *P. javana* differs from *P. Candolleana* by the fruit, which in *P. javana* is hispid, and by the involucre, which in *P. javana* is few-leaved. According to CLARKE, the difference is, that *P. javana* has its upper leaves reduced and not pennatifid, and its fruit less strongly ribbed.

According to MIQUEL l. c. *P. javana* differs from *P. Leschenaultii* by the leaves, that are „rotundata obtusissima" in the latter, and by the stature that is „humilior".

From the materials of *P. Candolleana* and *P. Leschenaultii* seen by me in the Kew Herbarium, is evident that, between *P. javana* on the one hand and all other species above mentioned on the other hand, there is only one constant difference, *viz.* that the fruit of *P. javana* is densely hairy with short spreading hairs, whereas in all other species mentioned it is more or less covered with scale-like papillae. The latter species, however, are so little different that it would probably be better to unite them into one. The forms first described as *P. Candolleana* and *P. Leschenaultii* are, indeed, rather distinct, as the former has the lower leaves ovate-cordate, the latter cordate-orbicular, but intermediary forms are not absent, and looking over the whole group of allied forms mentioned in the above, it appears impossible to distinguish among it any well defined species.

As the peculiar fruit indumentum of *P. javana* was not met with by me among the rather polymorphic materials of this alliance, I prefer to keep provisorily *P. javana* apart as a species, though it seems questionable whether this difference is sufficient to justify such a separation.

MOLKENBOER and MIQUEL (ll. cc.) distinguish the varieties *macrophylla, sylvestris,* and *microphylla*, especially based on differences in the dimensions of stems and leaves. This variations are, however, too slight to be named as varieties.

Pimpinella javana is common in Java on the mountain summits from G. Soendara eastward, and moreover occurs in Bali. The elevations on which it is found vary between 1200 and 3125 m.

JAVA. G. Soendara, 2000 m el., LÖRZING 441 (B, BD); G. Oengaran, nr. Medini, JUNGHUHN s.n. (L) authentics of *Pimpinella javana* var. *macrophylla* MOLKENB.; G. Merbaboe, 2000 m el., BALLY s.n. (B); 2200 m el., BÜSGEN 201 (B); 2340 m el., JUNGHUHN s.n. (L), authentics of *Pimpinella javana* var. *microphylla* MOLKENB.; 2800 m el., DOCTERS VAN LEEUWEN s.n. (B); 2900 m el., DOCTERS VAN LEEUWEN s.n. (B); 3100 m el., DOCTERS VAN LEEUWEN 1166 and s.n. (B); summit, 3125 m el., DOCTERS VAN LEEUWEN s.n. (B); G. Merapi, JUNGHUHN s.n. (L); WARBURG 4281 (BD); 1200 m el., JUNGHUHN s.n. (L), authentics of *Pimpinella javana* var. *sylvestris* MOLKENB.; G. Lawoe, G. Sidoramping nr. Sarangan, 1800 m el., ALTMAN 192 (B); G. Wilis, TEYSMAN s.n. (B); WARBURG 4220 (BD); upper regions, JUNGHUHN s.n. (L), authentics of *Pimpinella javana* var. *macrophylla* MOLKENB.; above Kediri, 1700—1800 m el., BACKER 11589 (B, L); G. Walirang, ZOLLINGER 2202 (BD), original of *Murrithia cordata* ZOLL. & MOR.; G. Ardjoena, JUNGHUHN s.n. (L), authentics of *Pimpinella javana* var. *microphylla* MOLKENB.; summit Widadarèn, 2100 m el., KOORDERS 38251 β (B, L); Lalidjiwo, WURTH s.n. (B); RANT s.n. (B); 2500 m el.,

KOORDERS 43853 β (B); above Lalidjiwo, 2800 m el., BREMEKAMP s.n. (B); DE VOOGD s.n. (B); G. Kawi, summit, JUNGHUHN s.n. (L), authentics of *Pimpinella javana* var. *microphylla* MOLKENB.; G. Boetak, 2500 m el., DOCTERS VAN LEEUWEN 12426 (B); 2650—2800 m el., DOCTERS VAN LEEUWEN 12456, 12209 (B); G. Tengger, KOORDERS 37883β (B); Casuarina forest, VAN SLOOTEN 2342 (B); above Tosari, RANT s.n. (B); ZEYLSTRA 6 (B); 1800 m el., POSTHUMUS s.n. (G); 2000—2400 m el., BACKER 8382 (B, L); 2200—2300 m el., BACKER & POSTHUMUS s.n. (B); Tjemara Poekoel, 2000 m el., DOCTERS VAN LEEUWEN 4562 (B); between Tosari and Ngadiwono, 2000—3000 m el., MOUSSET 337 (B, BD); between Tosari and Ngadisari, WENT s.n. (L); nr. Ngadisari, 2200 m el., KOORDERS 37879 β (B, L), v.n.: *kemboan*; G. Kembang, nr. Ngadisari, 2100 m el., KOORDERS 37880 β (B), v.n.: *kemboan*; between Tosari and the Penandjaan, 2400 m el., LEEFMANS 17 (B, L); Moenggal and Penandjaan, 2200—2500 m el., KOBUS s.n. (B, L), v.n.: *glongong, soempoengan*; Moenggal Pass, 2400 m el., WISSE 509 (B); JESWIET 598 (B); Bromo forest, JESWIET s.n. (B), v.n.: *kemboan*; G. Widadaren, nr. Kedoenen, 2300—2400 m el., KOORDERS 37881 β (B, L); 37882 β (B), v.n.: *gembokan*; G. Widadarèn, summit, JUNGHUHN s.n. (L), authentics of *P. javana* var. *microphylla* MOLKENB.; G. Seméroe, ZOLLINGER l. c.; G. Ijang, G. Krintjing, 2400—2700 m el., BREMEKAMP & BACKER 9824 (B); G. Idjen, ZOLLINGER l.c.

BALI. VAN STEENIS, after communication by letter of June 13, 1936.

3. **Pimpinella pruatjan** MOLKENBOER — Perennial herb. Stems several, ascending, 5—50 cm high, sometimes spread and rooting and forming rosettes, terete, striate, puberulous when young, later glabrescent. Leaves for the greater part in rosettes; petioles to 10 cm long with a sheath to 3 cm long; lamina imparipennate, with 3—11 leaflets (rarely only one), these leaflets sessile or subsessile, roundly-cordate, 1—2.5 cm long crenate-serrate to bicrenate-serrate, or slightly lobed, the upper leaves shorter-petioled and smaller, with leaflets less deeply incised and narrower more acute segments, all leaves sparingly hairy above, densely so below in the youth, glabrescent later. Inflorescences terminal to the stems and the branches, but often seemingly opposite to the leaves; peduncles 1—7 cm long; rays 4—8 in number, 7—25 mm long; pedicels 4—8 in each umbel, 1—4 mm long; involucres and involucels 3—6-leaved, the bracts nearly filiformous, those of the involucels shorter than the outer pedicels. Calyx teeth none; petals nearly 1.25 mm long by 1 mm broad, with inflexed tip. Mericarps nearly 2 mm long, 1 mm broad, warty. (Description after the materials under mentioned.)

Heterachaena alpina ZOLLINGER, in Nat. & Geneesk. Arch. Ned. Ind., 2, p. 577 (1845); *Anisometros alpina* HASSKARL, in Flora, 30, p. 602 (1847); ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848, p. 139 (1854); *Pimpinella pruatjan* MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 97 (1851) cum var. *depressa*; MIQUEL, Fl. Ind. Bat., I, 1, p. 739 (1856) cum var.s *depressa* & *polyphylla*; JUNGHUHN, Java, ed. HASSKARL, 1, p. 432 (1857); TEYSMANN & BINNEND., Cat. pl. Hort. Bot. Bogor. (1866) p. 166; MIQUEL,

Ill. Fl. Arch. Ind. (1871) p. 40; FILET, Plantk. Woordenb. (1876) p. 252; BECCARI, Malesia, 1 (1877) p. 219; in Bot. Jahrb., 1, p. 29 (1881); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 618; WIGMAN, in Teysmannia, 4, p. 740, 743 (1893); KOORDERS, in Nat. Tijdschr. Ned. Ind., 60, p. 371 (1901); DE CLERCQ, Plantk. Woordenb. (1909) p. 304; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 727; DOCTERS VAN LEEUWEN, in Verh. Kon. Akad. Wetensch. Amsterd., afd. Natuurk., sect. 2, 31 (1933) p. 124; VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 256 (1934); p. 390 (1935); *Pimpinella Panatjan* MIRB., ex ROSENTH., Syn. Pl. Diaphor., p. 533 (1862); *Carum Panatjan* BAILLON, Hist. Pl., 7 (1880) p. 178; *Pimpinella alpina* (non HOST 1827) KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228 (1911) p. 98; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 728; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 399; WOLFF, in ENGLER, Pflanzenr., IV, 228, Heft 90 (1927) p. 272; HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1214; RANT, in Nat. Tijdschr. Ned. Ind., 89, p. 451 (1929); VAN STEENIS, in Trop. Nat., 19 (1930) p. 77, 78, 83, 84, 89, 90; DOCTERS VAN LEEUWEN, in Verh. Kon. Akad. Wetensch. Amsterdam, afd. Natuurk., sect. 2, 31 (1933) p. 195; BURKILL, Diction. Econ. Prod. Mal. Pen., 2, p. 1728 (1935); *Pimpinella Leeuwenii* WOLFF, in FEDDE, Repert., 20, p. 159 (1924); in ENGL., Pflanzenr., IV, 228, Heft 90 (1927) p. 273; VAN STEENIS, in Trop. Nat., 19 (1930) p. 78; DOCTERS VAN LEEUWEN, in Verh. Kon. Akad. Wetensch. Amsterdam, afd. Natuurk., sect. 2, 31 (1933) p. 57, 68, 124, 195; *Pimpinella pruatjan* var. *prolifera* VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 349 (1935).

Pimpinella pruatjan is closely allied to *P. ascendens* DALZIELL, from Peninsular India. In *P. pruatjan* the leaves are often tripartite, usually pennate with 5 leaflets, rarely with up to 11 leaflets, the fruit granular-scaly. In *P. ascendens* the leaves are pennate with usually 7, rarely down to 3 leaflets, the leaflets are usually smaller and always sessile, the fruit are short-hairy. The leaf differences are certainly inadequate to distinguish the two as different species, and that in the indumentum of the fruit perhaps neither, though it is very remarkable.

Pimpinella pinetorum MERRILL, from the Philippines, is also closely allied; it has the fruit sparingly and shortly hairy, and for the rest strongly resembles *P. pruatjan*; therefore it is hardly specifically different from *P. pruatjan*, and certainly not from *P. ascendens*.

Pimpinella Leeuwenii, distinguished by WOLFF, certainly is not more than a variety of *P. pruatjan*, as VAN STEENIS remarked, who called it var. *prolifera* (l. c.). WOLFF enumerates as distinctive characters of *P.*

Leeuwenii: the lack of an erect flower bearing stem, the forming of long sympodic stolones bearing inflorescences opposite the leaves and forming rosettes, and the marked heterophylly. Indeed, such specimens occur, but between them and the typical *P. pruatjan* there are so many intermediate forms, that *P. Leeuwenii* cannot be maintained as a species and hardly as a distinct variety. The fruit of *P. Leeuwenii* is entirely like that of *P. pruatjan,* and shows the same differences with *P. ascendens.*

Pimpinella pruatjan occurs in the mountains of Java from 1800 to 3300 m elevation; its most western locality is on Mt. Pangranggo, its most eastern on Mt. Argapoera.

The species name *pruatjan* is the native name used by the Javanese in Mt. Diëng, according to JUNGHUHN; the correct form of the name probably is *poerwotjèng,* as given by TEYSMANN and WIRJOSAPOETRO.

JAVA. Without exact locality: JUNGHUHN s.n. (L); G. Pangranggo, 3000 m el., DOCTERS VAN LEEUWEN 5586 (B, L), 5729 (B, BD, type of *Pimpinella Leeuwenii* WOLFF); STOMPS s.n. (B); VAN STEENIS 4656 (B); G. Papandajan, summit, 2622 m el., VAN DER PIJL 208 (B); slope, and G. Saroni, VAN STEENIS 4121 (B, K); Tegal Pandjang, 2041 m el., VAN STEENIS 4230 (B, K, S); S. of G. Djaja, 2050 m el., ECOMA VERSTEGE s.n. (B), v.n.: *antanan kawat*; ravine Tjiparoegpoeg and Tegal Aloen-aloen, 2400—2600 m el., VAN STEENIS 4101 (B, K); ibidem, 2450—2500 m el., DOCTERS VAN LEEUWEN 13146 (B), 13171 (B, K), 13173 (B); 2650 m el., POLAK s.n. (B); G. Tjikoerai, summit, 2818 m el., SCHEFFER D33, D34 (B), v.n.: *kioerad, antanan goenoeng*; 2500—2800 m el., DOCTERS VAN LEEUWEN 8360 (B, BD, K, L), erroneously 3360 in several herbaria; G. Prahoe, HORSFIELD s.n. (K); Diëng, dèsa Diëngkoelon, 2000 m el., WIRJOSAPOETRO 59 (L), v.n.: *poerwotjeng*; TEYSMANN s.n. (B), v.n.: *poerwotjeng*; 1860 m el., JUNGHUHN s.n. (L), v.n.: *pruatjan,* authentics of *Pimpinella pruatjan* MOLKENB.; 2060 m el., BACKER 21741 (B); G. Oengaran nr. Medini, JUNGHUHN s.n. (L), authentics of *Pimpinella pruatjan* MOLKENB.; G. Merbaboe, above Sèlo, WARBURG 4221 (BD), v.n.: *tjoemboean*; G. Ardjoena, 2100—3300 m el., ZOLLINGER 2252 (B, BD), originals of *Heterachaena alpina* ZOLL. & MOR. = *Anisometros alpina* HASSKARL; 2400—3000 m el., KOORDERS 38252 β 43794 β (B); summit, way to Lalidjiwo, WURTH s.n. (B); above Lalidjiwo, 3000 m el., BREMEKAMP s.n. (B); G. Kawi, Ȯro-oro, 2600 m el., DOCTERS VAN LEEUWEN 12355 (B); G. Boetak, 2850 m el., DOCTERS VAN LEEUWEN 12217 (B); G. Tengger, 2400 m el., ZOLLINGER 2252 (B, L), originals of *Heterachaena alpina* ZOLL. & MOR. = *Anisometros alpina* HASSKARL; Tosari, 1800—2500 m el., KOBUS s.n. (B), v.n.: *ketoembar ales*; Moenggal Pass, Penandjaan, 2200—2500 m el., KOBUS s.n. (B); Moenggal Pass, RIDLEY s.n. (K); 2200—2400 m el., BACKER 1119 (B); way to Penandjaan, RANT s.n. (B); G. Batok, 2200 m el., KOORDERS 37886 β (B), v.n.: *roempoet dempoh*; G. Widadarèn, Kedoewan, Roedjah, 2300 m el., KOORDERS 37885 β (B), v.n.: *soeri pandok abong*; summit, JUNGHUHN l. c.; summit, 2400 m el., KOORDERS 37884 β (B, L), v.n.: *gebangan depok*; Penandjaan, 2650 m el., DOCTERS VAN LEEUWEN 4575 (B); G. Argapoera, 2500—2800 m el., BACKER 13331 (B); summit, 3020 m el., KOORDERS 43453 β (B, L).

XVII. OENANTHE

LINN., Sp. pl., ed. 1 (1753) 1, p. 254; Gen. pl., ed. 5 (1754) p. 122; BENTHAM & HOOK.F., Gen. pl., 1, p. 905 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 695 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 620; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 204 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1249 (1926); *Dasyloma* D. C., Prodr., 4 (1830) p. 140; *Sium* sect. *Drepanophyllum* BLUME, Bijdr. Fl. Ned. Ind., 15 (1826) p. 881.

Only species:

1. **Oenanthe javanica** (BL.) D. C. — Perennial herb, entirely glabrous. Stems 10—100 cm high, erect or ascending from a creeping base, terete, ramose. Leaves petioled and with sheath; petiole up to 10 cm long, often entirely sheathy; lamina pennate to bipennate with ovate serrate to narrowly oblong segments, or the segments divided again, this making the leaf 4—5-pennate. Inflorescences terminal and opposite to the leaves; peduncles 1—20 cm long, rarely none; umbel rays 0.5—3 cm long, 5—15 in number; pedicels 10—25 in each umbellule, 2—5 mm long; involucre none or one-leaved, involucels with 2—8 linear 2—4 mm long leaves. Calyx teeth distinct, acute, nearly 0.5 mm long; petals nearly 1 mm long, 0.75 mm broad, with a long inflexed tip. Mericarps 2—3 mm long, 0.5—1 mm broad, with swollen ribs, the marginal ones much more swollen than the dorsal ones, the latter, if strongly swollen often nearly entirely confluent.

Sium javanicum & *Sium laciniatum* BLUME, Bijdr. Fl. Ned. Ind., 15 (1826) p. 881; *Falcaria javanica* D. C., Prodr., 4 (1830) p. 110; HASSKARL, Aant. nut. (1845) p. 115; MOLKENBOER, in MIQUEL, Pl. Junghuhn., p. 95 (1851); *Falcaria laciniata* D. C., Prodr., 4 (1830) p. 110; MOLKENBOER, in MIQ., Pl. Junghuhn., p. 96 (1851); *Oenanthe stolonifera* D. C., Prodr., 4 (1830) p. 138; KURZ, in Journ. As. Soc. Beng., 46, p. 115 (1877); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 696 (1879); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 204 (1898); BAILEY, Queensl. Fl., 2 (1900) p. 726; KOORDERS, in Nat. Tijdschr. Ned. Ind., 60, p. 370 (1901); MATS. & HAYATA, Enum. pl. Formosa (1906) p. 172; DE CLERCQ, Plantk. Woordenb. (1909) p. 292; HOSSEUS, in Beih. Bot. Centralbl., 28, 2, p. 421 (1911); RIDLEY, in Transact. Linn. Soc., ser. II, bot., IX, 1 (1916) p. 63; in Journ. F. M. S. Mus., VIII, 4 (1917) p. 42; Fl. Mal. Pen., 1 (1922) p. 871; CHERMEZON, in LEC., Fl. Indo-Ch., 2, p. 1149 (1923); CRAIB, Fl. Siam. enum., 1, p. 790 (1931); *Oenanthe linearis* D. C., Prodr., 4 (1830) p. 138; CLARKE, in HOOK.F., Fl. Br.

Ind., 2, p. 696 (1879); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 204 (1898); CHERMEZON, in LEC., Fl. Indo-Ch., 2, p. 1149 (1923); *Oenanthe javanica* D. C., Prodr., 4 (1830) p. 138; HASSKARL, Cat. pl. Hort. Bot. Bogor. (1844) p. 163; ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 139; MIQUEL, Fl. Ind. Bat., I, 1, p. 740 (1856); TEYSMANN & BINNEND., Cat. pl. Hort. Bot. Bogor. (1866) p. 166; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 41; FILET, Plantk. Woordenb. (1876) p. 297; KOORDERS-SCHUM., Syst. Verz. I, 1, fam. 228 (1911) p. 99; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 729; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 400; BÜNNEMEIJER, in Trop. Nat., 7 (1918) p. 70, ic. 7; OCHSE, Trop. groenten (1925) p. 190, ic. p. 191; HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1215; VAN STEENIS, in Trop. Nat., 17 (1928) p. 205; LAM, in Nat. Tijdschr. Ned. Ind., 89, p. 351 (1929); DAKKUS, in Bull. Jard. Bot. Buitenzorg, sér. III, suppl. 1 (1930) p. 208; OCHSE & BAKH., Ind. groenten (1931) p. 715, ic. 434; VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 9, p. 168 (1932); BURKILL, Diction. Econ. Prod. Mal. Penins. (1935) 2, p. 1578; *Dasyloma benghalensis* D. C., Prodr., 4 (1830) p. 140; WIGHT, Ic. pl., t. 568 (1843); MIQUEL, Fl. Ind. Bat., I, 1, p. 742 (1856); *Phellandrium stoloniferum* ROXBURGH, Hort. Beng. (1814) p. 21, nomen; Fl. Ind., ed. CAREY, 2 (1832) p. 93; ed. CLARKE (1874) p. 271; *Oenanthe laciniata* ZOLLINGER, Syst. Verz. Ind. Arch. 1842—1848 (1854) p. 139; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 42; KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228 (1911) p. 99; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 728; MERRILL, Bibl. Enum. Born. Pl. (1921) p. 459; Enum. Phil. Fl. Pl., 3, p. 239 (1923); RIDLEY, in Journ. Mal. Br. Roy. As. Soc., 1, p. 63 (1923); *Dasyloma javanicum* & *Dasyloma laciniatum* MIQUEL, Fl. Ind. Bat., I, 1, p. 741 (1856); TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 165; FILET, Plantk. Woordenb. (1876) p. 168, 239; *Dasyloma japonicum* & *D. subbipinnatum* MIQUEL, Ann. Mus. Bot. Lugd. Bat., 3 (1867) p. 59; *Oenanthe benghalensis* BENTH. & HOOK.F., Gen. pl., 1, p. 906 (1867); CLARKE, in HOOKER FIL., Fl. Br. Ind., 2, p. 696 (1879); KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 204 (1898); MATSUMURA & HAYATA, Enum. Pl. Formos. (1906) p. 172; KOORDERS-SCHUM., Syst. Verz., III (1914) p. 100; CHERMEZON, in LEC., Fl. Indo-Chine, 2, p. 1148 (1923); CRAIB, Fl. siam. enum., 1, p. 790 (1931); ? *Oenanthe Thomsoni* CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 697 (1879); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 204 (1898); CHERMEZON, in LEC., Fl. Indo-Chine, 2, p. 1150 (1923); *Oenanthe stolonifera* var. *javanica* KUNTZE, Rev. gen. pl., 1 (1891) p. 269;

Oenanthe Schlechteri WOLFF, in SCHUM. & LAUTERB., Nachtr. Fl. deutsch. Schutzgeb. (1905) p. 333, t. 14; LANE-POOLE, For. res. Papua (1925) p. 130, 181.

Oenanthe javanica is very variable as to the dimensions of all its parts, the compoundness of its leaves, the length of its peduncles, the number of pedicels in its umbellules, and the dimensions of its fruit. The form with pennatifid to pennatipartite leaflets was originally distinguished as a distinct species, *Sium laciniatum,* from the less divided form *Sium javanicum,* but a complete series of intermediary forms proves that these strikingly different forms are only extreme varieties of one species.

Oenanthe stolonifera is, since long, recognized as synonymous with *Oe. javanica,* but the species name *javanica* has priority over that of *stolonifera.*

Oenanthe benghalensis is said by KOORDERS to be found by him in Selebes. According to CLARKE the real *Oe. benghalensis* is distinguished from *Oe. javanica* by peduncles very short or none, leaves strongly divided, and the fruit very short; to these differential characters CHERMEZON adds that the styles are shorter than half the length of the fruit, and that the calyx teeth are very short. The specimen collected by KOORDERS in the Minahassa has peduncles up to 7 cm long and for the rest does not show the differential characters mentioned. In the further material mentioned below there occur, however, specimens that in several respects agree with the descriptions as given by CLARKE and CHERMEZON, but there can be traced no limit between the forms that can be reckoned to *O. benghalensis* and those that can not. From the materials present in the Kew Herbarium appears that in British India *O. benghalensis* is distinctly different from *O. javanica,* and in these materials *O. benghalensis* is, besides by the characters mentioned above, characterised by the stems strongly branched from the base; however in the materials from China and Japan, in the same herbarium, the limits between *O. benghalensis* and *O. javanica* become quite undefined, as is the case in the Malay Archipelago. It is therefore that I prefer to consider *O. benghalensis* as a form of *O. javanica.*

In Sumatra there have been collected, moreover, two forms that, being strongly different as to the leaves, make the impression of being separate species.

The first of them is represented by the numbers OUWEHAND 157 and 345 (see below), and is remarkable by leaves pennate to bipennate, with segments up to 4 cm long and 1—4 mm broad, entire, or sometimes with 2 or 3 incisions in the apical part. These plants have been

labelled by C. A. BACKER as *Oenanthe linearis,* and indeed they agree with the descriptions of this species as given by DE CANDOLLE, CLARKE and CHERMEZON. When we compare it with the originals of *O. linearis* extant in the Kew Herbarium, we are struck by the fact, that the Sumatra plant is a more extreme form than these originals. Also in China there occur forms that are intermediates between the most typical form, as represented by OUWEHAND's plants, and common *O. javanica.* One of these has been described as *O. rivularis* by DUNN (in Journ. Linn. Soc., 35, p. 496); it is said to differ from *O. linearis* by the leaves long-petioled and with short sheath, and by „foliis tenuis dissectis", but it is apparently intermediate between *O. linearis* and *O. javanica.*

The second of them is represented by the number PRINGGO 170, with leaves 3—5-pennate and segments only 1—2 mm long, 0.5—1 mm broad. It has been labelled as *O. Thomsonii* by VALETON, and indeed agrees with the descriptions of this species, as given by CLARKE and CHERMEZON, as well as with the originals of *O. Thomsonii* in the Kew Herbarium. Yet I can not acknowledge it as a separate species, as between it and *O. javanica* there exist, among the materials mentioned, a complete series of intermediate forms.

Oenanthe Schlechteri, from New Guinea, is distinguished by WOLFF from *Oe. javanica* on account of its small fruit, of which only the marginal ribs are strongly swollen, the dorsal ribs, on the contrary, not at all, so that, after WOLFF, there might be good grounds to base upon *Oe. Schlechteri* a new section of the genus *Oenanthe.* That *Oe. Schlechteri* may hardly be considered as a slight variety of *O. javanica* is proved by the following facts. WOLFF describes the fruit of *Oe. Schlechteri* as 2 mm long, 1.5 mm broad (by typographical error 2 cm by 1.5 cm). Now the fruit of further materials of the species vary from 2 to 3 mm in length and from 0.5—1 mm in breadth, from which we see that *Oe. Schlechteri,* in this respect, is not even an extreme variation of *Oe. javanica.* As to the second difference we may remark the following. According WOLFF's own figure (Nachträge t. 14) the fruit of *Oe. Schlechteri* are normal *Oenanthe*-fruit, but with the dorsal ribs only slightly swollen. Such fruit, however, and fruit with the dorsal ribs swollen to the most different degrees, may be found among the materials of *Oe. javanica* enumerated below, and that not only as different varieties, but often on the same plant or even in the same inflorescence.

MALAY PENINSULA. Penang, cultivated at Ayer Stone, nr. sea level, HOLTTUM s.n. (K), v.n.: *selomor, shelum*; Dindings, Lumut, RIDLEY & CURTIS s.n. (S); Perak, Temanggo, RIDLEY 14604 (BM, S), v.n.: *lampong.*

SUMATRA. Atjèh, Lant Toepandji, 1900 m el., VAN STEENIS 6374 (B); Pakpak, Koeta Benö, PRINGGO ATMODJO (Exp. VAN DAALEN) 509 (B, L); Gajoeloeëus, Woihnikela, PRINGGO ATMODJO (Exp. VAN DAALEN) 170 & 181 (B, L); San Klewang valley, N.E. of Sibolangit, 350 m el., LÖRZING 4088 (B); Karo Plateau, foot of Daleng Koetoe, 1250 m el., LÖRZING 4912 (B); Berastagi, RIDLEY s.n. (K); BURKILL 104 (S); Berastagi, 1300 m el., LÖRZING 6737 (B); below G. Sibogal, 1200 m el., HOLTTUM 15456 (K, S); Petami valley, 1300 m el., LÖRZING 6015 (B, L, U); Lagoe Roti in Lake Toba, 900 m el., OUWEHAND 157 (B); Ranau Dolok, 1100 m el., OUWEHAND 345 (B); between Pisopiso and Tonggin, on Lake Toba, 1300 m el., LÖRZING 8114 (B); S. foot of Pisipiso, 1400 m el., LÖRZING 9379 (B); Pinto, summit, 2200 m el., LÖRZING 8281 (B, L); „Prubatua", HAGEN s.n. (B), v.n.: *batjarongi*; Toba plateau nr. Sidamanik, BEUMÉE A452 (B); G. Talang, 350 m el., BÜNNEMEIJER 5667 (B, L, U); G. Kerintji, Soengai Koembang, 1350 m el., ROBINSON & KLOSS 75 (BM) and s.n. (K, S); 1600—2020 m el., BÜNNEMEIJER 8723 (B, K, S), 8984, 9464, 9607, 9724 (B); Bèngkoeloe, Liwa, 800 m el., DE VOOGD 115 (B), v.n.: *randji*; Bt. Daoen, 1300 m el., DE VOOGD 1407 (B); Moearadoea, 150 m el., GRASHOFF 472 (B), v.n.: *piopo*; Kp. Oedjoeng, e. of G. Pesagi, 1000 m el., VAN STEENIS 3716 (B).

POELAU LINGGA. S. Pangga, TEYSMANN s.n. (B).

ANAMBAS & NATOENA ISLANDS. Siantar, e. of Tarèmpa, 90—100 m el., HENDERSON 20247 (S), VAN STEEIS 996 (B, S).

BORNEO. Without exact locality (Bandjarmasin, ex MIQUEL), KORTHALS s.n. (L).

JAVA. Without exact locality: VAN HASSELT s.n. (L); BLUME s.n. (B, L), v.n.: *tespong*; KORTHALS s.n. (L); ZIPPELIUS s.n. (L); ZOLLINGER 2235 (BD, BM); HORSFIELD s.n. (K, S), 418 (K), v.n.: *panpoeng*; NAGEL 230 (BD); HILLEBRAND s.n. (BD); WAITZ s.n. (L); LAHAYS 43 (BM); „Tjisereh", KUHL & VAN HASSELT 748 (B); G. Megamendoeng, ZIPPELIUS s.n. (L); Nirmala, 1000 m el., BACKER 10822 (B); G. Perbakti, n.w. of Tjitjoeroeg, Tjikerang, 1500 m el., BAKHUIZEN VAN DEN BRINK 6605 (B), v.n.: *tespong*; G. Gedé, Tjibodas, REINWARDT 589? (L); Tjibodas, 1200 m el., KOORDERS 31731 β (B), v.n.: *tespong*; between Tjibodas and Tjibeureum, HALLIER 380, 439 (B), v.n.: *tespong*; Tjibeureum, 1600 m el., BOERLAGE s.n. (B, L); PULLE 4034 (U); REYNVAAN 28 (G); DEN BERGER 623 (B); DANSER 5953 (G); VAN STEENIS 1910 (B); SAPIIN s.n. (B), v.n.: *tespong*; above Tjibodas, 1600 m el., BACKER 13542, 31382 (B); Rarahan, 1400 m el., BACKER 13650 (B); Geger Bintang, BURCK 586 (B), v.n.: *tespong*; SAPIIN s.n. (B), v.n.: *tespong*; G. Semboeng, s.w. of Bandoeng, 1300 m el., BACKER 12277 (B, L); S. of Tjibeber, 950 m el., BACKER 22366 (B, L); 1000 m el., WINCKEL 1135 β (B), v.n.: *tespong*; BAKHUIZEN VAN DEN BRINK 1854 & 2611 (B), v.n.: *tespong, kitespong*; Tjadas Malang nr. Tjidadap, S. of Tjibeber, 1000 m el., WINCKEL 1360 β (B), v.n.: *tespong*; BAKHUIZEN VAN DEN BRINK 2497 (B), v.n.: *tespong*; Takokak, 1000 m el., KOORDERS 15036 β, 15246 β (B), v.n.: *tespong rawa*; Rantja Oepas nr. Telaga Patengan, 1750 m el., BACKER 12710 (B); G. Patocha nr. Rantjawalini, 1725 m el., LÖRZING 1312 (B); above Rawah Tjiwidej, 1900 m el., VAN STEENIS 6963 (B); G. Malabar, 1200—2100 m el., ANDERSON 190 (K); Pengalengan, WARBURG 3122 (BD); Rantja Gedé nr. Pengalengan, 1600 m el., BACKER 26093 (B); Taloen nr. Bandoeng, 1600 m el., REYNVAAN s.n. (B); G. Telagabodas, BOERLAGE s.n. (L); HASSKARL s.n. (B), v.n.: *tespon*; BURCK 127 (B), v.n.: *tespong*; KORTHALS s.n. (L); G. Galoenggoeng above

Singaparna, 600 m el., BACKER 8635 (B); Rawah Oepoe nr. Kali Poetjang, 10 m el., BACKER 4473 (B); G. Tjeremai, above Linggardjati, 560 m el., BACKER 4883 (B, K, L); Petoengkriana, 900 m el., BACKER 15958 (B); 1300—1600 m el., BACKER 15798 (B); between Dara & Petoengkriana, 1000—1200 m el., BACKER 15714 (B); G. Diëng, JUNGHUHN s.n. (L), v.n.: *pambong*; TEYSMANN s.n. (B), v.n.: *pampoeng*; WARBURG 4224 (BD); DOCTERS VAN LEEUWEN 2259 (B); Diëng Plateau, 2000 m el., BACKER 21691 (B), v.n.: *pampong alas*; Telaga Dringoe, 2000 m el., VAN SLOOTEN 420 (B); G. Boetak, E. of Tlerep, 1800 m el., LÖRZING 69 (B, BD), v.n.: *bampoeng*; Garoeng, 1100—1400 m el., BACKER 21909 (B); Bandongan, 1000 m el., KOOPER 39 (B); G. Soendara, nr. Kledoeng, 1600 m el., BLOKHUIS s.n. (B), Oengaran, Medini, JUNGHUHN s.n. (L), v.n.: *ketol*; G. Telemaja, KOORDERS 28045 β (B), v.n.: *pangpoeng*; 1300 m el., DOCTERS VAN LEEUWEN 198 (B); Sepakoeng, 1000 m el., KOORDERS 36318β (B), v.n.: *pampoeng*; Pager Goenoeng, S.W. of Semarang, 1000 m el., DOCTERS VAN LEEUWEN 175 (B); Pening, in the Rawah Pening, nr. Ambarawa, KOORDERS 29655 β (B), v.n.: *pampoeng*; Banjoebiroe, Rawah Pening, KOORDERS 36236 β (B), v.n.: *pangpoeng*; Salatiga, DOCTERS VAN LEEUWEN sn.. (B); G. Merapi, nr. Bodojo, 390 m el., JUNGHUHN s.n. (L); 1500—1800 m el., JUNGHUHN s.n. (L); G. Wilis, Ngebel, 700 m el., KOORDERS 23194 β (B); Batoe, nr. Malang, RANT s.n. (B); G. Tengger, road to Poespo, RIDLEY s.n. (K); Tosari, RIDLEY s.n. (K); Ngadisari, 2000 m el., KOORDERS l. c., v.n.: *ketoembar*; Smeroe hoeve, 2100 m el., VAN STEENIS 7278 (B); G. Ijang, 2100 m el., CLASON G9 (G), v.n.: *matjen salade ajer*; Ijang Plateau, 2100 m el., KOORDERS 43432 β (B), v.n.: *sladri gunung*; Kali Deloeang, 2200 m el., BACKER 9570 (B); Telaga Trata nr. Poeger, 5 m el., KOORDERS 21377 β (B), v.n.: *seladren*; G. Idjen, swamp nr. temple, VAN DER PIJL 147 (B); Idjen Plateau, Rawah Simpol, 900 m el., KOORDERS 43164 β (B); Sempol, 1100 m el., BACKER 25047 (B); Ragadjampi, ZOLLINGER 2588 (B, BM).

LESSER SUNDA ISLANDS. Without exact locality, DE VOOGD 1851 (B).

BALI. Batoeriti, Danau Bratan, RUTTNER 316 (B).

LOMBOK. Swela, 362 m el., RENSCH 76 (B).

SELEBES. Tomohon, SARASIN 540 (BD); REINWARDT 756 (L); between Tomohon and Tondano, 700 m el., KOORDERS 19031 β (B); Tondano, FORSTEN 78 (L), v.n.: *roekoet telemmé*; Sidoa, forest above Napoe, adjunct veterinary surgeon of Donggala no. 97 (B); Sogori, FORSTEN 885 (BM).

BOEROE. Lake Raña, 800 m el., L. J. TOXOPEUS 228 (B, L).

NEW GUINEA. On the Rouffaer River, DOCTERS VAN LEEUWEN 9723 (B); 175 m el., DOCTERS VAN LEEUWEN 9904 (B); Nassau Mts., 1200 m el., DOCTERS VAN LEEUWEN 10735 (B); affluent of the Swart River, S. slope, 1250 m el., LAM 2076 (B), alcohol materials only; Utakwa Expedition, Camp III—IX, 900—1650 m el., KLOSS s.n. (BM); Camp VIc & VII—IX, KLOSS s.n. (K); Kloof Bivouac, 30 m el., PULLE 162a—g (B); Oroh valley, cultivated in native villages, 1300 m el., PULLE 1175 (B); Noord River, VON RÖMER 125 or 123 (B); Saruwaged Mts., Ogeramnang, 1800 m el., MAYR 826 (BD); Sepik River, bivouac 42, SCHULTZE 185 (BD); on the Waria, nr. Gobi, 350 m el., SCHLECHTER 19846 (BD); Schumann River, SCHLECHTER 13821 (B, BD, cotype of *Oenanthe Schlechteri* WOLFF); Finschhafen District, Nomi River, 1500 m el., and Kulentufu Ioangey, ex LANE POOLE l. c.; Mt. Tafa, 2100 m el., BRASS 4150 (NY); Mafulu, 1250 m el., BRASS 5334 (NY); Mt. Scratchley, Neneba, about 1200 m el., GIULIANETTI s.n. (K).

Distribution: British India, China, Japan, Siam, Formosa, Philippines, Queensland.

XVIII. FOENICULUM

ADANSON, Fam. pl., 2 (1763) p. 101; BENTH. & HOOK.F., Gen. pl., 1, p. 902 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 695 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 619; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 208 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1284 (1926).

Only species:

1. **Foeniculum vulgare** MILLER — Perennial herb, entirely glabrous. Stems erect, up to 2 m high. Leaves with membranous-margined sheath, in the lower leaves 4—12 cm long, shorter in the upper ones, and with cucullate-connate auricles at the top; lamina usually 3—4-pennate, with filiformous segments. Compound umbels terminal to the stem and the branches; peduncles 5—16 cm long; involucres and involucels none; umbel rays 30—70 in number, 5—7 cm long; pedicels 5—30 in each umbellule, 0.5—1 cm long. Calyx teeth none; petals yellow, strongly curled inward. Mericarps oblong, nearly 8 mm long 2 mm broad, with filiformous nearly equal ribs, not at all winged.

Anethum Foeniculum LINN., Sp. pl., ed. 1 (1753) 1, p. 263; *Foeniculum vulgare* MILLER, Gard. dict., ed. 8 (1768); D. C., Prodr., 4 (1830) p. 142; WIGHT & ARNOTT, Prodr., (1834) p. 371; HASSKARL, Cat. Pl. Hort. Bot. Bog. (1844) p. 164; JUNGHUHN, in Nat. & Geneesk. Arch. Ned. Ind., 2, p. 33 (1845); MOLKENBOER, in MIQ., Pl. Jungh., p. 98 (1851); MIQUEL, Fl. Ind. Bat., I, 1, p. 742 (1856); suppl. Sum. (1860) p. 134; TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 166; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 43; FILET, Plantk. Woordenb. (1876) p. 1; BAKER, Fl. Maur. & Seych. (1877) p. 133; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 695 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 620; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 208 (1898); KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; in Teysmannia, 11, p. 239 (1901); in Nat. Tijdschr. Ned. Ind., 60, p. 370 (1901); MATSUMURA & HAYATA, Enum. pl. Formos. (1906) p. 171; DE CLERCQ, Plantk. Woordenb. (1909) p. 243; DE JONG, in Teysmannia, 20, p. 351 (1909); BACKER, in Ann. Jard. Bot. Buitenz., suppl. 3, 1 (1910) p. 402; KOORDERS-SCHUM., Syst. Verz., I, 1, fam. 228 (1911) p. 99; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 729; HAYATA, Ic. pl. Formos., 5 (1912) p. 54; VAN DONGEN, Overz. geneesmidd. Ned. Ind. (1913)

p. 130; BAILEY, Compr. Cat. Queensl. Pl. (1913) p. 229; WIGMAN, in VAN GORKUM, O.I. Cult., 2 (1913) p. 883; BOLDINGH, Zakfl. Landbouwstr. Java (1916) p. 174; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 400; MERRILL, Enum. Phil. Fl. Pl., 3, p. 239 (1923); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1284, ic. 2484—2486, t. 200, 1 (1926); HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1215; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. III, suppl. 1 (1930) p. 142; EWART, Fl. Victoria (1930) p. 908; OCHSE & BAKH., Ind. groenten (1931) p. 712, ic. 432; CRAIB, Fl. siam. enum., 1, p. 790 (1931); VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, t. 3 (1935); BURKILL, Diction. Econ. Prod. Mal. Pen. (1935) 1, p. 1027; *Foeniculum capillaceum* GILIBERT, Fl. lithuan. inchoata, coll. IV (1782) p. 40; HIERN, in Fl. Trop. Afr., 3 (1871) p. 3; *Foeniculum officinale* ALLIONI, Fl. pedem., 2 (1785) p. 25; BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 209; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 208 (1898); *Ozodia foeniculacea* WIGHT & ARNOTT, Prodr. (1834) p. 375.

Foeniculum vulgare, originally cultivated, appears to be naturalized on several mountains in eastern Java, *e. g.* on Mt. Lawoe (after communication by Dr. BACKER) and on Mt. Tengger from Tosari to the Sandsea (after KOORDERS, and HEYNE, ll. cc.).

JAVA. Batavia, JUNGHUHN s.n. (L), cultivated, v.n.: *ahtès*; Buitenzorg, HEYNE s.n. (B), cultivated; Salabintana, n. of Soekaboemi, 1000 m el., BACKER 26532 (B), cultivated; Lemah Goenting, nr. Bandoeng, DOCTERS VAN LEEUWEN s.n. (B), cultivated; G. Tjikoerai, BURCK 391 (B); Sadang, OCHSE s.n. (B), cultivated, v.n.: *hades*; Diëng Plateau, 2050 m el., BACKER 21899 (B), cultivated, v.n.: *adas*; G. Merbaboe, JUNGHUHN l. c.; Wanasari, VAN SLOOTEN 2366 (B); Sepakoeng, 1000 m el., KOORDERS 36322 β (B), cultivated, v.n.: *adas*; Bajalali, BEGUIN s.n. (B); G. Lawoe, above Maospati, 500 m el., BACKER 4670 (B), cultivated; 1600 m el., DORGELO (after communication by Dr. C. A. BACKER); Lebaksari, near Poedjon, 800 m el., cultivated, VAN STEENIS 2619 (B); G. Ardjoena, 3300 m el., KOORDERS 43789β (B), v.n.: *adas*; Malang, cultivated, OCHSE s.n. (B); G. Tengger, Tosari, 1700 m el., BACKER 8356 (B); above Tosari, 1800—2000 m el., BACKER & POSTHUMUS s.n. (B); Tosari, Moenggal, Penandjaan, 1800—2500 m el., KOBUS s.n. (B), v.n.: *adas*; Ngadisari, 2000 m el., KOORDERS 37876β (B, L), v.n.: *adas*; between Tosari and Ngadisari, WENT s.n. (L); S.W. Tengger, 1800—2400 m el., BEUMÉE A632, v.n.: *nadar*; G. Bromo, RANT s.n. (B).

TIMOR. Cultivated, REINWARDT (?) s.n. (L).

SELEBES. Tondano, cultivated, FORSTEN s.n. (L).

BANDA. coll.? (L), v.n.: *adas manis*.

Distribution: indigenous in the Mediterranean region, cultivated throughout the world (THELLUNG l. c.).

XIX. ANETHUM

LINN., Sp. pl., ed. 1 (1753) 1, p. 263; Gen pl., ed. 5 (1754) p. 127; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 208 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1290 (1926); *Peucedanum* sect. *Anethum* BENTH. & HOOK.F., Gen. pl., 1, p. 919 (1867).

Only species:

1. **Anethum graveolens** LINN. — Annual herb. Stems 50—100 cm high, terete, striate. Leaf-sheath rather short, 1.5—2 cm in the lower leaves, shorter in the upper leaves, white-margined, with cucullate-connate auricles at the apex; lamina tri-pennate with filiform segments. Compound umbels terminal to the stem and the branches; peduncles 4—13 cm long, umbel-rays 5—15 in number, 2—4 cm long; pedicels 5—25 in number, 0.5—1 cm long; involucre and involucels none. Calyx teeth none; petals yellow, strongly curved inward. Mericarps oblong, nearly 5 mm long, 3 mm broad, moreover with a wing 0.25—0.5 mm broad.

Anethum graveolens LINN., Sp. pl., ed. 1 (1753) 1, p. 263; D. C., Prodr., 4 (1830) p. 186; HASSKARL, Cat. Pl. Hort. Bot. Bogor. (1844) p. 164; MIQUEL, Fl. Ind. Bat., I, 1, p. 743 (1856); TEYSMANN & BINNEND., Cat. Pl. Hort. Bot. Bogor. (1866) p. 166; FILET, Plantk. Woordenb. (1876) p. 1; BAKER, Fl. Maurit. & Seych. (1877) p. 133; BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 210; MASSART, in Mém. Soc. Bot. Belg., 34, p. 203, 324 (1895); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 208 (1898); DE CLERCQ, Plantk. Woordenb. (1909) p. 168; KOORDERS, Exkursionsfl. Java, 2 (1912) p. 730; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 400; CHERMEZON, in LEC., Fl. Indo-Ch., 2, p. 1152, ic. 136, 9 (1923); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1291, ic. 2307b, 2487, 2488 (1926); HEYNE, Nutt. Pl. Ned. Ind., ed. 2 (1927) 2, p. 1215; OCHSE & BAKH., Ind. groenten (1931) p. 695, ic. 423; CRAIB, Fl. siam. enum., 1, p. 791 (1931); BURKILL, Diction. Econ. Prod. Mal. Pen., 1, p. 158 (1935); *Anethum Sowa* D. C., Prodr., 4 (1830) p. 186; ROXBURGH, Fl. Ind., ed. CAREY (1832) 2, p. 96; WIGHT & ARN., Prodr. (1834) p. 372; WIGHT, Icones, 2, t. 572 (1843); ROXBURGH, Fl. ind., ed. CLARKE (1874) p. 272; CRAIB, Fl. siam. enum., 1, p. 791 (1931); *Peucedanum graveolens* HIERN, in Fl. Trop. Afr., 3 (1871) p. 19; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 709 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 622; HAYATA, Mat. Fl. Formosa, p. 130 (1911); Ic. pl. Formos., 2 (1912) p. 57; WIGMAN, in VAN GORKUM, O.I. Cult., 2 (1913) p. 883; VAN DONGEN, Overz. Geneesmidd. Ned. Ind. (1913) p. 130; EWART, Fl. Victoria (1930) p. 905.

SUMATRA. Palèmbang, Moearadoea, 250 m el., in native gardens, GRASHOFF 418 (B), vn..: *adas*; Lampongs, G. Rató Berenong, 400 m el., IBOET 266 (B, L).

JAVA. Batavia, 10 m el., coll.? (B), v.n.: *adas*, cultivated; BACKER s.n. (B); HEYNE s.n. (B); between Batavia & Meester Cornelis, cultivated, BACKER s.n. (B); Buitenzorg, 250 m el., BACKER s.n. (B); Sindanglaja, cultivated, OCHSE s.n. (B); Tjipanas nr. Sindanglaja, 1050 m el., BACKER 21503 (B); G. Goentoer, cultivated in the garden of Hotel Kamodjan, after oral communication by Prof. DANSER, Groningen; also cultivated in the mountains of E. Java, after oral communication of Prof. J. KUYPER, Groningen.

MADOERA. Pegantènan, cultivated, VORDERMAN 97 (B), v.n.: *adas.*

SOEMBA. Mengiliwai nr. Maomarroe, IBOET 432 (B, U), v.n.: *walahandji.*

TIMOR. Collector? „ex Herb. Paris" (K), imperfect specimen.

NEW GUINEA. Merauke, KOCH s.n. (B, L), v.n.: *djinten*, mentioned by VALETON, in Bull. Agr. Ind. Néerl., 10 (1907) p. 43, as *Foeniculum vulgare.*

Distribution: wild in S. and S.W. Asia, cultivated in most parts of the world (after THELLUNG, l. c.).

XX. PASTINACA

LINN., Sp. pl., ed. 1 (1753) p. 262; Gen. pl., ed. 5 (1754) p. 126; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 238 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1404 (1926).

Only species:

1. **Pastinaca sativa** LINN. — Biennial herb. Primary root fusiformis. Stems angular and strongly grooved. Leaves pennate, the leaflets 2—13 cm long, 1—5 cm broad, oblong-ovate, often 3-lobate to 3-partite, irregularly crenate. Inflorescences terminal to the stem and its branches; peduncles 3—7 cm long; umbel-rays 5—12 in number, 1—4 cm long; pedicels 10—20 in number, 2—7 mm long; involucres and involucels none or 1—2-leaved. Calyx teeth none; petals yellow, with inflexed tip. Mericarps nearly 5—7 mm long, 4—5 mm broad, broad-elliptical, the marginal wing 0.25—0.5 mm broad inclusive. (Description after European materials.)

Pastinaca sativa LINN., Sp. pl., ed. 1 (1753) 1, p. 262; D. C., Prodr., 4 (1830) p. 188; BENTHAM, Fl. austr., 3 (1866) p. 336; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 238 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1405, ic. 2435b, 2542—2544, t. 203, 2 (1926); BURKILL, Diction. Econ. Prod. Mal. Pen., 2, p. 1677 (1935).

JAVA. Salabinta above Soekaboemi, 900 m el., cultivated, BACKER 22156 (B).

Distribution: spontaneous in Europe and temperate Asia, cultivated and subspontaneous elsewhere (THELLUNG l. c.).

XXI. HERACLEUM

LINN., Sp. pl., ed. 1 (1753) 1, p. 249; Gen. pl., ed. 5 (1754) p. 118; BENTHAM & HOOKER FIL., Gen. pl., 1, p. 921 (1867); DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 239 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1415 (1926).

Only species:

1. **Heracleum sumatranum** BUWALDA n. sp. — **Fig. 6.** — Caulium pars inferior ignota, partes quae exstant ad 80 cm longae, prope basin ad 6 mm crassae, probabiliter erectae, teretes, striatae vel leviter sulcatae, basin versus glabrae, apices versus magis vel minus hirsutae, pilis ad 0.5 mm longis, nodis nonnihil incrassatis, internodiis inferioribus 20—55 cm longis, superioribus gradatim breviores et minus crassis. Folia sparsa, inferiora ignota, media (inferiora partium quae exstant) rosulas minores in axillis ferentia, sessilia in vaginis ad 40 mm longis 15 mm latis amplexicaulibus margine membranaceis apice auriculatis vel in petiolum brevissimum attenuatis; folia inferiora biternata foliolo apicali tripartito vel ternato, circuitu deltoidea, ad 20 cm longa 28 cm lata, foliolis primariis longe petiolulatis petiolulo folioli primarii terminalis 10 cm longo lateralium 3.5 cm longo, petiolulis foliolorum secundariorum et tertiariorum gradatim brevioribus, ultimorum terminalium 1 cm longis, lateralium nullis; folia superiora gradatim minus composita, suprema ternata; foliola foliorum caulinorum oblongo-ovata longiuscule acuminata, terminalia oblongiora quam lateralia, ad 8 cm longa 3 cm lata, foliorum superiorum etiam angustoria, omnia serrata subbiserrata, dentibus breve acuminatis apiculatis 1—2 mm longis 2—5 mm latis, facie superiore subglabra, inferiore nervis tenuiter hirsutis; folia rosularum axillarium probabiliter ut basalia sed minora et minus composita, petiolo lamina breviore, subbiternata, foliolis latioribus. Pedunculi inflorescentiarum 10—20 cm longi, ceterum ut caules; involucra nulla, involucella bracteis lanceolatis, longe acuminatis, 6—7 mm longis, c. 0.5 mm latis, paulum hirsutis, margine angusto membranaceo; radii umbellae 9—12, tempore florendi 1.5—3 cm longi, sulcati, breve hirsuti, postea 4—6 cm longi, magis divaricati, denique subreflexi; pedicelli ad 20 in quaque umbellula, tempore florendi 2—5 mm longi, tenuiter denseque hirsuti, postea 8—12 mm longi, gradatim magis divaricati vel etiam reflexi. Ovarium 0.75 mm longum et

Fig. 6. — *Heracleum sumatranum*, after BÜNNEMEIJER 2629; *a*: stem with leaves, *b*: inflorescence, and *c*: fruit-bearing inflorescence, all ½ ×; *d*: pedicel with carpophore; *e*: mericarp seen from the outside; *f*: mericarp seen from the inside, all 3 ×.

Fig. 6 — *Heracleum sumatranum* (cf. p. 204, bottom).

latum; calycis dentes inconspicui, flores marginales autem saepe dente singulo prolongato ad 1.25 mm longo; petala florum centralium elliptica ad obovata, ad 1.5 mm longa 1 mm lata, apice angusto inflexo ad 1 mm longo, florum marginalium radiantia, exteriora late obcordata, ad 3 mm longa 4 mm lata; filamenta c. 2.5 mm longa; antherae c. 0.75 mm longae 0.5 mm latae; styli tempore florendi c. 0.3 mm longi, postea ad 1 mm longi, denique decidui; stylopodium tempore florendi planum, postea conicum ad 1 mm altum. Mericarpia circuitu rotundato-obovata, 6.5—8 mm longa, 5.5—7 mm lata, glaberrima, margine ala tenui membranacea c. 2.5 mm lata, corpore elliptico apice basique acuto 3—4 mm longo 2 mm lato, jugis dorsalibus 3 parte media latiusculis vittis angustis tantum separatis, parte apicali et basali tenuibus parallelis, jugis marginalibus remotis ad 0.5 mm a margine currentibus, vittis omnibus transverse septatis, facie exteriore 6, 2 inter juga dorsalia seminis corpore fere aequilongis, apice basique acutis, utroque latere jugorum dorsalium binis, quarum interiores seminis corpore aequilongae, exteriores plerumque apice basique breviores, liberae acutae vel cum interioribus confluentes et obtusae, facie interiore (commissura) carina indistincta obtusa mediana vittisque 4, quarum interiores minus quam 1 mm remotae, seminis corpore aequilongae, exteriores interioribus proximis et parallelis, plerumque dimidio breviores; carpophorum tenue, usque ad basin bifidum.

Heracleum sumatranum BUWALDA, ex VAN STEENIS, in Bull. Jard. Bot. Buitenzorg, sér. III, 13, p. 255 (1934) nomen.

There is some difficulty about the question, whether our plant is a *Heracleum*, a *Pastinaca*, or a *Peucedanum*.

According to BENTHAM and HOOKER (Gen. pl., 1, p. 870, 871, 918—921), it certainly is either a *Peucedanum* (this genus including *Pastinaca*), or a *Heracleum*. Between these two genera there appear to exist no constant characters, but because of the radiating flowers, the hirsute indumentum, the rather broad leaflets, the broad mericarps, the vittae, especially the lateral ones, not prolongated down to the base of the fruit, and the hairy ovary, our plant is rather a *Heracleum* than a *Peucedanum*.

After the characters given by DRUDE (in ENGLER and PRANTL, Nat. Pflanzenfam., III, 8, p. 115), we cannot state whether our plant belongs to the *Ferulinae* or to the *Tordyliinae*, as only detached mericarps are available. In the former case it would be a *Pastinaca*, in the latter a *Heracleum*. The differences, indicated for the distinction for *Pastinaca* and *Heracleum*, are slight, but on the same arguments as enumerated above one should conclude that our plant is a *Heracleum*.

According to THELLUNG (in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1405), *Pastinaca* is more closely allied to *Heracleum* than to *Peucedanum,* and *Pastinaca* differs from *Heracleum* by non-radiating flowers and transversely septate vittae, whereas *Heracleum* often has radiating flowers and always non-septate vittae. Now our plant has radiating flowers, but distinctly septate vittae, so that a decision based on these characters appears difficult. I found, however, distinctly septate vittae also in *Heracleum Wallichii* D. C. in the Kew Herbarium.

On the ground of the general appearance, the hirsute indumentum, the radiating flowers, and the hairy ovary, I prefer to accept the present new species as a *Heracleum.*

The locality, where our plant has been collected justifies the supposition that it may be a specimen of some species of the Asiatic Continent. Therefore I have tried to identify it with one of the British Indian species of the Kew Herbarium. From these materials appears that none of these species resembles our plant to such a degree, that the latter might be reckoned to it; it even is evident, that those species, to which our plant comes most closely, show less differences than our plant from them all; these species belong to the group enumerated in the Flora of British India from *Heracleum Wallichii* D. C. to *H. barmanicum* KURZ.

As already remarked, the British Indian species show only slight differences, and it seems questionable whether many of these could not better be united to one polymorphic one. The distinction is mainly based on the locality, the dimensions, the colour of the ripe fruit, the leaf shape, and the development of involucels and calyx teeth, all of them very variable in *Heracleum* species. In that case also our species might perhaps better be regarded as a form of such a polymorphic species, but I am not in the condition to sattle this question.

SUMATRA. Padang Uplands, G. Singgalang, 2400 m el., BÜNNEMEIJER 2629 (B, L), flowers white.

XXII. DAUCUS

LINN., Sp. pl., ed. 1 (1753) 1, p. 242; Gen. pl., ed. 5 (1754) p. 113; BENTH., Fl. austr., 3 (1866) p. 376; BENTHAM & HOOK.F., Gen. pl., 1, p. 928 (1867); CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 718 (1879); BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 623; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 248 (1898); THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1501 (1926).

Only species:

1. **Daucus Carota** LINN. — Annual, biennual or perennial herb. Primary root fusiformous. Stems erect, striate or grooved, hirsute. Leaves 2—3-pennatipartite with lanceolate segments. Compound umbels with flat or rounded surface when flowering, with incurved peduncles aud pedicels and hollow surface when fruiting; peduncles 2—25 cm long; umbel rays 15—30 in number, 1—6 cm long; pedicels 20—30 in number in each umbellule, 0.5—1.5 cm long; involucral leaves 3—5 cm long, pennatipartite, white-margined towards the base; involucels 5—7-leaved, the leaves entire to pennatipartite, lanceolate, 0.5—2 cm long. Calyx teeth triangular, acute, 0.25—0.5 mm long. Petals in all flowers white, or dark-red in 5—7 central sterile flowers of the middle-umbel, with inflexed tip, the peripheric ones of the inflorescence radiating. Mericarps nearly oblong, 3 mm long, 1.5—2 mm broad, the primary ribs filiformous with rather few nearly 0.25 mm long fine bristles, the secundary ribs beset with nearly 1 mm long rigid bristles. (Description after Javan and European specimens.)

Daucus Carota LINN., Sp. pl., ed. 1 (1753) 1, p. 242; D. C., Prodr., 4 (1830) p. 211; WIGHT & ARN., Prodr. (1834) p. 374; HASSKARL, Cat. pl. Hort. Bot. Bogor. (1844) p. 164; MIQUEL, Fl. Ind. Bat., I, 1, p. 743 (1856); TEYSMANN & BINNEND., Cat. pl. Hort. Bot. Bogor. (1866) p. 166; BENTHAM, Fl. austr., 3 (1866) p. 377; MIQUEL, Ill. Fl. Arch. Ind. (1871) p. 43; HIERN, in Fl. Trop. Afr., 3 (1871) p. 25; FILET, Plantk. Woordenb. (1876) p. 10; BAKER, Fl. Maurit. & Seych. (1877) p. 133; CLARKE, in HOOK.F., Fl. Br. Ind., 2, p. 718 (1879); BISSCHOP GREVELINK, Pl. Ned. Ind. (1883) p. 212; BOERLAGE, Handl. Fl. Ned. Ind., I, 2 (1890) p. 624; KOORDERS, Versl. Dienstr. Minah. (1898) p. 488; DRUDE, in ENGL. & PR., Nat. Pflanzenfam., III, 8, p. 249 (1898); KOORDERS, Exkursionsfl. Java, 2 (1912) p. 730; WIGMAN, in VAN GORKUM, O.I. Cult., 3 (1913) p. 696; HEYNE, Nutt. Pl. Ned. Ind., ed. 1, 3 (1917) p. 401; OCHSE, Trop. groenten (1925) p. 185, ic. p. 188; THELLUNG, in HEGI, Ill. Fl. Mitteleur., V, 2, p. 1508, ic. 2576—2583, 2575d, t. 204, 2 (1926); HEYNE, Nutt. pl. Ned. Ind., ed. 2 (1927) 2, p. 1216; EWART, Fl. Victoria (1930) p. 902; DAKKUS, in Bull. Jard. Bot. Buitenz., sér. III, suppl. 1 (1930) p. 96; OCHSE & BAKH., Ind. groenten (1931) p. 708, ic. 430; VAN STEENIS, in Bull. Jard. Bot. Buitenz., sér. III, 13, p. 345, t. 3 (1935); BURKILL, Diction. Econ. Prod. Mal. Pen., 1, p. 772 (1935).

Daucus Carota, originally introduced in Java as a vegetable, appears to be naturalized in some localities in the mountains, e. g. near Rarahan, on Mt. Gedé, and on Mt. Tengger, near Tosari, where it grows, just like in Europe, among the grass along road sides.

SUMATRA. Cultivated near Berastagi and Pematang Siantar, brought at the market in Médan (after oral communication by Prof. J. KUYPER, Groningen).

JAVA. Without exact locality, WAITZ s.n. (L); cultivated, HASSKARL s.n. (B); Batavia, cultivated, BACKER s.n. (B); Buitenzorg, cult., SMITH s.n. (B); Tjipanas, Tjibodas, cult., 1300 m el., VAN STEENIS 1809 (B); nr. Rarahan above Sindanglaja, 1300 m el., DANSER 6022 (G), growing wild; Semarang, brought upon the market from the mountains, MULLER, Nat. & Geneesk. Arch. Ned. Ind., 2, p. 465 (1845); G. Tengger, above Tosari, 1800 m el., BACKER 8377 (B); 1700—1800 m el., BACKER s.n. (Pa), along paths among the grass.

TIMOR. Cultivated and subspontaneous, after MIQUEL, l. c.

Distribution: spontaneous in Europe, N. Africa, and temperate Asia, cultivated in all parts of the world (THELLUNG, l. c.).

Species dubia.

Hydrocotyle azorellacea F. v. MUELLER, in Journ. Bot., 31, p. 324 (1893). This species is mentioned without description as a new species, collected with other plants by Sir W. MACGREGOR on the summit of the Owen Stanley's Range. It is incidentally typified with the following words: „a new *Hydrocotyle (H. azorellacea)*, much resembling a *Huanaca* in habit".

Species excludendae.

Bifora testiculata (LOUREIRO) HOFFMANN — MIQUEL, in Fl. Ind. Bat., I, 1, p. 744 (1856), mentions *Atrema testiculatum* MIQ., = *Coriandrum testiculatum* LOUREIRO, = *Bifora Loureiri* KOSTELETZKY, as probably occurring in Java and the other Sunda Islands, and this supposition is taken over by BOERLAGE, in Handl. Fl. Ned. Ind., I, 2 (1890) p. 623, under the right name *Bifora testiculata* HOFFMANN. As far as known, no specimens of this species have ever been met with in Java, neither cultivated nor wild, and MIQUEL's supposition that the plants mentioned by MOLKENBOER in the Plantae Junghuhnianae under *Coriandrum sativum*, but with the remark „involucro involucellisque multifidis et umbellâ 6—8-radiata", might be this species, is incorrect as well.

Conium maculatum LINN., perhaps found subspontaneous in the Netherlands Indies according to BOERLAGE (Handl. Fl. Ned. Ind., I, 2, p. 616), in reality has never been found there.

Hydrocotyle villosa KOORDERS, in Teysmannia, 11, p. 252 (1901), probably is a writing mistake for some other common species. The true *H. villosa* LINN.FIL. is a native of South Africa.

ERRATUM.

On page 130, line 12 from bottom, before the name ZOLLINGER, the name *Hydrocotyle latisecta* must be inserted.

Index of herbarium numbers,

referring to the species by means of their genus number and, if necessary, their species number.

XVII; 2830, 3658=I,1; 4359=IV; 4389=V; 4661=IV; 4659=I,1; 5549=I,2; 6605=XVII; 6700=I,2; 6801=XIII,2; 7010, 7011=I,2; 7412=VIII.

BALLY s.n. = XVI,2.

BARENDS s.n. = V.

BARTLETT s.n. = II.

BECCARI P.S. 331=IV; 623=I,1.

BEGUIN s.n. = XVIII; 73, 313, 625=II; 1781=XIII,2.

BEUMÉE 6D, 4300=II; 4809=V; A120 =IV; A452=XVII; A632=XVIII.

BLAKELY s.n. = III,1.

BLOKHUIS s.n. = IV, XVII.

BLUME s.n. = I,1(2×), I,2, II(2×), IV(2×), XVII.

BOERLAGE s.n. = I,1, I,2, II(2×), IV (2×), V(2×), XVII(2×); 108=I,2.

BRANDERHORST 146=III,2; 251=II.

BRASS 4150=XVII; 4177=III,13; 4244 =III,1; 4307, 4358, 4404=IX,3; 4475=I,2; 4513=III,13; 4670=I,2; 4671=III,1; 4753=IX,3; 4898=I,2; 5005=I,1; 5334=XVII; 5682 =IX,3.

BREMEKAMP (cfr. also BACKER & BREMEKAMP) s.n. = I,1, IV, XVI,2, XVI,3.

BRINKMAN 268=IV; 278=II; 321=I,1; 322=I,2.

BÜNNEMEIJER 839, 2579=IV; 2629=XXI; 2659, 3562=IV; 3778=I,1; 3790=IV; 4575=I,1; 4586, 5018=IV; 5162=I,1; 5544=IV; 5667=XVII; 7932=II; 7956=V; 8115=II; 8186=IV; 8723=XVII; 8794 =IV; 8984=XVII; 9112, 9202=IV; 9464, 9607=XVII; 9664=IV; 9724=XVII; 9783, 9960, 9986, 9987, 9988=IV; 10001=I,1; 10166 =IV; 10411=I,1; 10414, 10526=IV; 10990=I,1; 11639=I,2; 11898 =III,7; 11910=I,2; 12170=III,7; 12372, 12586=I,1.

BURBIDGE s.n. = III,1.

BURCK s.n. = I,1, I,2; 127=XVII; 391=XVIII; 510=I,1; 532=IV; 586=XVII.

BURKILL 12=IV; 73=I,1; 104=XVII; 761=XI,2; 3051=V; 8156=IV; 8252=I,2; 13902=I,1.

BURKILL & HANIFF 12375=II; 12446=V; 12912=I,1; 12915=I,2; 13740, 13966, 16799=II.

BÜSGEN 201=XVI,2.

BUYSMAN 98=II; 403=I,1; 3009=IV.

CANTLEY'S collector s.n. = V, XIII,2.

CLASON 130=IV; 164=I,1; A69=I,2; A70=II; E20=I,2; G9=XVII; G39=IV.

CLEMENS s.n. = I,1(2×), IV, IX,1; 10330=IV; 10522, 10538, 10563, 10612=III,1; 10622=IX,1; 21268 =I,2; 21269=II; 22309=I,2; 26382=I,1; 27098=III,1; 29725=IV; 29809=IX,1; 30058=III,1; 30682=IV; 30684, 32597=I,1; 33164=III,1; 33729=I,1; 33735=III,1; 34031=IV.

COSTER 99=I,1.

CURTIS (cfr. also RIDLEY & CURTIS) s.n. =I,1, V(2×), 1752=I,2; 1885=II; 2086=I,1; 3407=XI,2.

DANSER 5361=V; 5405=I,2; 5511=II; 5720=IV; 5953=XVII; 6022=XXII; 6145=IV; 6628, 6806=I,1; 6883=V.

DE BEYER 93=IV.

DE MONCHY s.n. = I,1; II, IV.

DEN BERGER 596=IV; 623=XVII; 702 =IV.

DENKER 79=IV; 92=I,1.

DE VISSER SMITS s.n. = I,1, IV.

DE VOGEL s.n. = I,2, II.

DE VOOGD s.n. = XVI,2; 35=I,1; 41=IV; 115=XVII; 171, 172=I,1; 506=IV; 1407, 1851=XVII; 2299 =IV; 2300=III,9.

DE VRIES 8=V.

DOCTERS VAN LEEUWEN s.n. = I,1(3×), I,2, II(2×), IV(2×), V(2×), XVI,2(4×), XVII, XVIII; 175, 198=XVII; 463=I,2; 1137=I,1;

KOENS 105=V; 116=I,1; 253, 282, 367 =IV; 393=II; 493=V.

KOOPER 39=XVII.

KOORDERS (β-numbers only) s.n. =VII; 15036=XVII; 15057=IV; 15135=V; 15244=IV; 15246=XVII; 15269 =V; 15518=II; 19031=XVII; 19032=I,1; 19033, 19034=II; 19035, 19036=I,1; 19037=II; 21377 =XVII; 21378=I,1; 21379=II; 23194=XVII; 23237=II; 23252=V; 23276=IV; 26231=V; 26530=IV; 27118=V; 27125=IV; 27126 =I,1; 28011=V; 28039=II; 28045 =XVII; 28050=IV; 28051=I,2; 28052, 28557=I,1; 29477=IV; 29654=II; 29655=XVII; 30867=II; 31679=IV; 31695=I,2; 31731 =XVII; 31800=IV; 31844=II; 31918=V; 32086=I,2; 32561=IV; 32613=V; 32668=I,1; 33163=I,2; 33176=I,1; 35653=II; 35917=V; 35976=IV; 36318=XVII; 36320=II; 36322=XVIII; 37090=I,2; 37466=IV; 37876=XVIII; 37877 =I,2; 37878=VIII; 37880, 37881, 37882, 37883=XVI,2; 37884, 37886 =XVI,3; 37887=IV; 37888=VII; 38091=XII; 38092=XI,1; 38252=XVI,3; 38093=VIII; 38251=XVI, 2; 36236=XVII; 37879=XVI,2; 37885=XVI,3; 40561=IV; 40769 =I,1; 41187=II; 42610=I,2; 43159=I,1; 43160, 43161=I,2; 43162, 43163=IV; 43164, 43432=XVII; 43453=XVI,3; 43460=I,2; 43466=IV; 43581=I,2; 43789=XVIII; 43794=XVI,3; 43853=XVI,2; 44301=V; 47887=IV; 47888=V; 47889=II.

KORNASSI 620=IV; 640=XIII,2; 731 =I,1; 1392=I,2.

KORTHALS s.n. = I,1(3×), I,2, II(2×), IV(3×), XVII(3×), 202=IV.

KUHL & VAN HASSELT 1=II; 748=XVII.

LAHAYS 43=XVII.

LAM 161=IV; 197=I,1; 1586=III,2; 1645=III,4; 1659=III,2; 1674=IX,2; 1692=III,2; 1694=IX,2; 2076=XVII; 2122=IV.

LAUTERBACH 1275, 2838=II.

LEDERMANN 10955, 11055a, 12064, 12391 =I,1.

LEEFMANS s.n. = II, IV; 17=XVI,2; 27=IV.

LIEFTINCK 22=IV.

LÖRZING 38=IV; 69=XVII; 106=I,1; 248, 295=I,2; 317=IV; 350=V; 441=XVI,2; 819=IV; 835=II; 1004, 1047=V; 1107=II; 1111=V; 1312=XVII; 1341=I,1; 1343=IV; 1431=I,1; 3082, 3509, 3859=II; 3867, 4033=I,1; 4088=XVII; 4216=XIII,2; 4826=I,2; 4904=VII; 4912=XVII; 4951=IV; 4976 =II; 5263=V; 5271=I,2; 5919=VII; 6015=XVII; 6071=I,2; 6074 =II; 6214=IV; 6245=I,2; 6246=II; 6269=VII; 6528=II; 6557=I,2; 6716=VII; 6737=XVII; 6786, 7463=I,1; 7660=I,2; 7818=IV; 8114=XVII; 8226=I,1; 8281=XVII; 8564=I,2; 8844=VII; 9367 =I,2; 9379=XVII; 9526=I,1; 9536=IV; 9775=II; 9808=I,2.

LOWE s.n. = III,1.

MACHADO 11544=V.

MATTHEW s.n. = IV(2×).

MAYR 547, 722, 810=I,1; 826=XVII.

MERRILL 6174=III,1.

MOTLEY 238=I,2.

MOUSSET 59=IV(2×); 88=II; 110=I,2; 116=I,2; 248=I,1; 332=I,2; 337=XVI,2; 647=I,1; 705=VII.

NAGEL 230=XVII; 259=I,1.

NATIVE COLLECTOR 44=III,1.

NOLTÉE 2590=V.

NUR 6204=II; 7423, 11413=I,1.

NUR & FOXWORTHY s.n. = I,1; 10283=I,1.

NYMAN 204=II; 474, 666=I,1.

OCHSE s.n. = VIII, XVIII(2×), XIX.

I,2; 4101, 4121=XVI,3 ; 4129=IV; 4158=II; 4230=XVI,3; 4337=IV; 4340=I,1; 4656=XVI,3; 5974=I,1; 5981=IV; 6092=II; 6374=XVII; 6541=I,1; 6963, 7278=XVII; 7342=I,1.

VAN SLOOTEN 299=IV; 339=I,2; 366=IV; 379, 381=II; 394, 416=I,2; 420=XVII; 600=XIII,2; 2342=XVI,2; 2366=XVIII.

VAN VUUREN s.n. = II, V.

VAN WELSEM s.n. = VIII; 22=IV.

VAN ZIJLL DE JONG 10=III,7.

VERSTEEG 1221=III,12; 1497=I,1; 1847=XIII,2.

VESTERDAL s.n. = I,2.

VOLKENS 178=IV.

VON RÖMER 123 or 125=XVII; 375, 1189=I,1; 1339=III,2.

VORDERMAN s.n. = XIII,2; 97=XIX; 119=I,2.

WAITZ s.n. = I,1, IV(2×), XVII, XXII.

WALSH 345=III,9.

WARBURG s.n. = I,2; 1688=XI,2; 3119=I,2; 3120=II; 3121=XI,1; 3122=XVII; 3123, 3124=IV; 4220=XVI,2; 4221=XVI,3; 4224=XVII; 4225=II; 4226=I,2; 4227=II; 4228=I,1; 4229=I,2; 4281=XVI,2; 4390, 11242=IV; 11243=I,1; 11244=II; 11429=V; 15173=II; 15174=I,1; 16131=IV; 16132, 16133, 16134=II; 18114=XIII,2; 18115, 20464=II; 20465=I,1.

WEINLAND 372=II.

WENT s.n. = XVI,2, XVIII.

WERKMAN s.n. = I,2.

WHITEHEAD s.n. III,1(3×).

WICHURA 657=II; 2136, 2137=IV; 2138=I,1.

WINCKEL (β-numbers only) s.n. =V; 127=II; 1131, 1134=I,2; 1135=XVII; 1146=V; 1147=II; 1360=XVII; 1866=II.

WINKLER (HUBERT) 2869=I,1; 2930=II.

WIRJOSAPOETRO 25=I,2; 59=XVI,3; 70=IV.

WISSE s.n. = II, V; 40=I,1; 64=XIII,2; 242=V; 259=IV; 509=XVI,2; 546=I,1; 619=II; 654=IV; 905=V; 1001=I,1.

WRAY 1458=I,1; 1765=II.

WURTH (cfr. also ARENS & WURTH) s.n. = II, XVI,2, XVI,3.

ZEYLSTRA 6=XVI,2.

ZIPPELIUS s.n. = I,1, II, IV(2×), XVII (2×).

ZOLLINGER 127=I,1; 632=II; 834=I,2; 1747, 1915=IV; 2202=XVI,2; 2008=I,1; 2235=XVII; 2252=XVI,3(2×); 2315=I,2; 2515==VII; 2542=I,2; 2588=XVII; 2757=VIII.

ZWAARDEMAKER 105=V.

INDEX OF VERNACULAR NAMES

occurring on herbarium labels.

INDEX OF SCIENTIFIC NAMES.

Names of accepted genera and species are printed in **heavy Roman,** synonyms in *italics,* all other names in Roman. Asterisks before names indicate new names and combinations, asterisks after page numbers indicate figures. Page numbers in heavy types indicate most important mention.

THE VERBENACEAE, COLLECTED IN PAPUA BY L. J. BRASS FOR THE ARCHBOLD EXPEDITION.

(American Museum of Natural History),
1933—1934

by

EVA BEER & H. J. LAM
(Leiden).

References:

H. J. LAM, The Verbenaceae of the Malay Archipelago, etc. Groningen, 1919.
——— & R. C. BAKHUIZEN VAN DEN BRINK, Bull. du Jard. bot. de Buitenzorg, Sér. III, Vol. III, 1921, 1—116.
——— & ———, Nova Guinea XIV, Livr. 1, 1924.

Mr. BRASS's New Guinea collection has yielded valuable data to our knowledge of the Verbenaceae. He discovered one new genus (*Archboldia*), 3 new species (*Clerodendron Brassii, C. populneum* and *Premna inaequilateralis*) and some interesting additions to the area's of earlier described species, among which the rediscovery of *Faradaya chrysoclada*, and the discovery of two species new for South New Guinea (*Premna sessilifolia* and *Teysmanniodendron bogoriense*) and of one more for the whole island (*Glossocarya Hemiderma*).

Archboldia.

(EVA BEER & H. J. LAM in Blumea II, 1936, 31).

A. ericoides E. BEER & H. J. LAM, l. c.

Western Division: Wuroi, Oriomo River, edge of small swamp in savannah forest (nr. 6025).

Endemic shrub about 1 m, with a few erect branches from enlarged stock, branchlets, petioles and underside of midribs purple; fr. very young red, in Jan.—March.

Callicarpa L.

1. **C. longifolia** LAM., forma **subglabrata** SCHAUER — East Asia to Tropical Australia.

Central Division: Dieni, Ononge Road, 500 m in alt. (nr. 3969).

Slender shrub, 2.2—5 m high, common in rain forest; fls. and fr. white, April—May.

2. **C. pedunculata** R. BR. — Formosa, Philippines, East Malaysia to Polynesia.

Central Division: Mafulu, 1250 m in alt. (nr. 5520).

Slender large bush or small tree, common in forest regrowths; fls. pink, fr. bright purple, Sept.—Nov.

3. **C. pentandra** ROXB., var. **Cumingiana** (SCHAUER) BAKH. — Malaysia.

Central Division: Dieni, Ononge Road, 500 m in alt. (nr. 3925); Mafulu, alt. 1250 m (nr. 5537).

Small tree, common in forest regrowth; fls. purple-pink, fr. red, Sept.—Nov. (Mafulu) and Apr.—May (Dieni).

4. **C. tomentosa** (L.) MURR., var. **lanata** (L.) BAKH. — India to New Guinea.

Central Division: Mafulu, 80 m in alt., on forested river bank (nr. 5495); Laloki Riv., Rona, in July, rain forest, alt. 450 m (nr. 3675).

Small slender tree; indumentum reddish brown, lvs. pale softly pubescent, fls. purple-pink, Sept.—Nov.; fr. purple-black, abt. 5 mm in diam., Apr.

Clerodendron L.

1. **C. Brassii** (§ Tridens) EVA BEER & H. J. LAM, nov. spec. — *fig. 1* — *Frutex*; *ramuli* glabri i. s. in nodis paulo inflati, internodia quadrangularia, alternatim deplanata; *folia* opposita, membranacea, glabra, late cordata, integra, apice acuminata, circ. 27 cm long, 20 cm lata (1 folium tantum videmus); costa media subtus prominens; nervi secundarii utrinque 9—10, eorum 3 inferiores ad basin conferta, paulo prominentes, recti vel paulo curvati et sinuosi; nervi tertiarii transversi, reticulatione minuta translucentim tantum conspicua; petiolus gracilis 12 cm longus; *inflorescentia* e pedunculo 7 cm longo paniculata, glabra bracteis parvo-foliosis persistentibus 1.5—0.4 × 0.5—0.2 cm, circ. 20 cm longa et lata (vel probabiliter major; unam tantum videmus); pedicelli graciles 0.3—0.4 cm longi; *calyx* glaber membranaceus circ. 1.5 cm longus tripartitus, 2 lobis majoribus apice bidentatis, 0.9—1.2 cm latis, 1 minore integro, 0.5 cm lato; *corolla* glabra exserta, in alabastro late clavato, tubus anguste cylindricus 2.5 cm longus, lobi 5 obovati subpatentes 1.5 × 0.8 cm; *stamina* 4 valde exserta, glabra, gracilia, 6—7 cm longa, corollae fauce inserta, antheris parvis, 0.25—0.35 cm longis; *stylus* filiformis exsertus, 6 cm longus, stigmate bifido; *ovarium* glabrum 4-sulcatum,

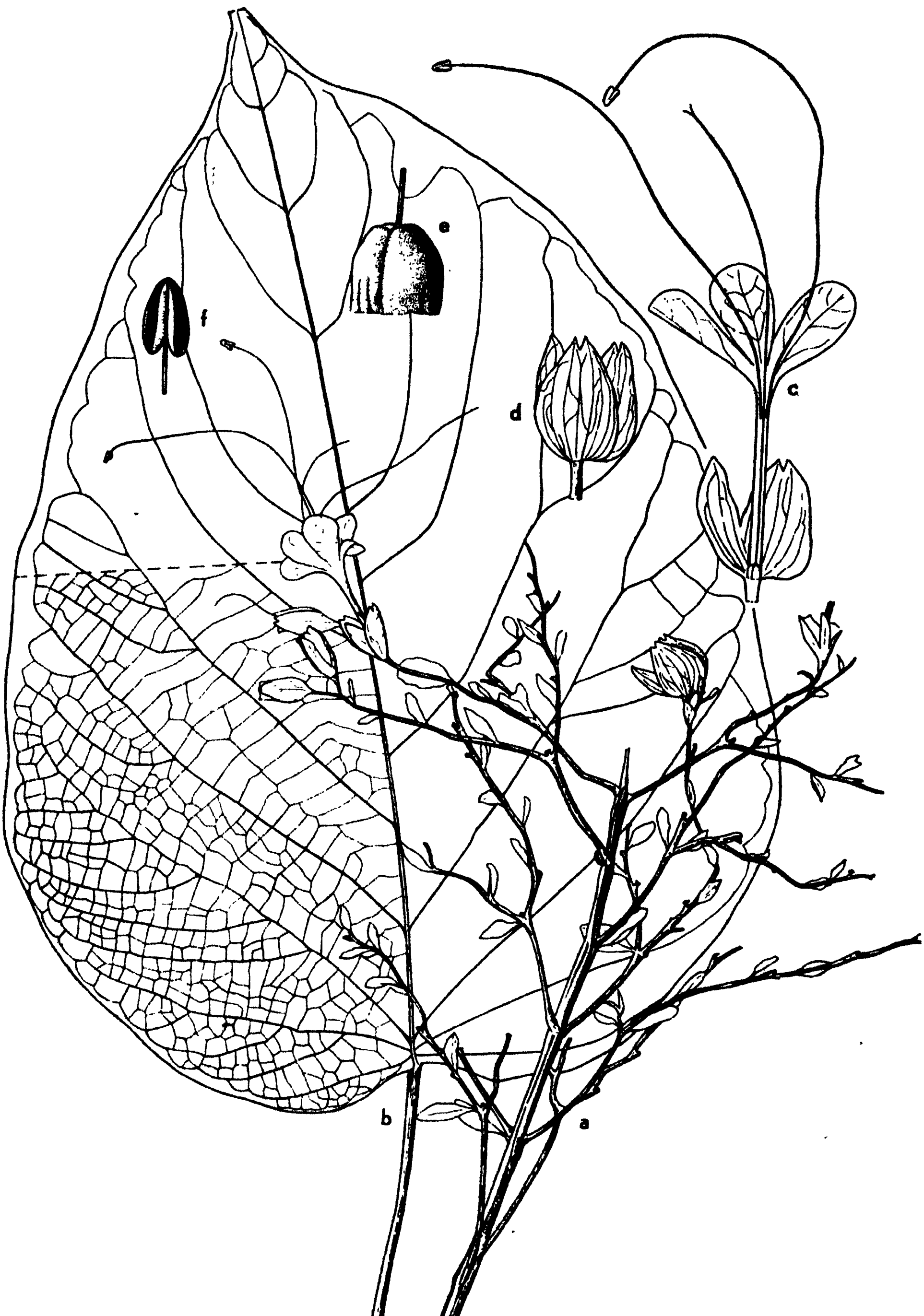

Fig. 1 — *Clerodendron Brassii,* nov. spec. — a. inflorescence; b. leaf; c. longitudinal section of flower; d. calyx; e. ovary and base of style; f. anther, ventral side — after type specimen.

imperfecte 4-loculatum, ovula anatropa 4, placentis parietalibus affixa: fructus ignoti.

Central Division: Dieni, Ononge Road, fairly common on roadside regrowths, alt. 500 m (nr. 3867, *type specimen*).

A soft-wooded shrub up to 2 m tall; branches, leaf nerves and petioles purple; fls. brownish red in April—May.

Named in honour of Mr. L. J. BRASS, who yielded so many valuable contributions to our knowledge of the Papuan flora.

The present species is a characteristic representative of the section *Tridens*, thusfar only known from the Lesser Sunda Islands by two species: *C. Elberti* HALL.F. and *C. Hettae* HALL.F. This is the more remarkable since this section, especially *C. Hettae*, shows in its calyx and corolla some relations to *Faradaya*, a typical eastern genus (N. Borneo, Talaud, Moluccas, New Guinea, Australia, Polynesia). This taxonomical relation is now geographically confirmed. All three species are closely allied; *C. Brassii* differs from *C. Elberti* only in some minor points (bidentate calyx lobes, broader petals); from *C. Hettae* it is distinguished by much smaller flowers.

2. **C. buruanum** MIQ. — Philippines, Moluccas, New Guinea.

Central Division: Dieni, Ononge Road, 500 m in alt. (nr. 3970); Bella vista, 1450 m in alt. (nr. 5448).

A tall shrub or small tree, common in rain forest. Lvs. dark green above, with impressed nerves, pale below, fls. white, in Apr.—May (nr. 3970) or calyx reddish and corolla cream coloured, in Nov. (nr. 5448).

3. **C. populneum** (§ Euclerodendron-Axilliflora) EVA BEER & H. J. LAM, nov. spec. — *fig. 2* — *Frutex*; *ramuli* glabri teretes, i. s. minute striati, laeves; *folia* decussato-opposita glabra, chartacea, longe petiolata acuminato-ovata, e basi lata breviter cuneato-attenuata, integra, apicem versus sensim attenuata, apice longe acuteque acuminata, 9—13 cm longa, 4.5—8 cm lata, petiolo i. s. gracili 2.5—5 cm longo, apicem versus canaliculato et sparse pubescenti; costa media subtus prominula; nervi secundarii e folii basi conspicue trinervi utrinque 6—7, inferiores usque ad $^1/_2$ vel $^2/_3$ folii adscendentes, omnes graciles, curvati; nervi tertiarii transversi, vix a reticulatione i. s. paulo prominula distincti; *inflorescentiae* in foliorum superiorum axillis positae, cymosae, pergraciles, glabrae, sine corollis 6—7 cm longae, 3—4.5 cm latae; pedunculi petiolo aequilongi 2.5—3 cm longi, 3—5-plo dichotomae; bracteae mox deciduae lineares basi pilosae; pedicelli gracillimi, 0.8—1 cm longi, cum bracteis nonnullis pilis subrigidis suffulti; *calyx* infundibuliformis 0.5—0.6 cm longus, usque ad $^1/_2$ vel $^2/_3$ quinquepartitus, glaber, laciniae subpatentes acute subulatae vel anguste deltoideae; *corolla* glabra, valde exserta, tubo anguste cylindrico 2—2.5 cm longo, 0.1 cm diametro, apicem versus paulo dilatato; petala oblonga, apice rotunda, 0.6—0.8 × 0.25 cm; *stamina* 4, 1.5 cm exserta circ. 2—2.5 cm longa, paulo sub fauce inserta, glabra,

antherae glabrae, i.s. atrae, circ. 0.1 cm longae; ***stylus*** corollae tubo aequilongus, haud exsertus, filiformis, stigmate bifido; ***ovarium*** glabrum, bicarpellatum, paulo sulcatum, imperfecte 4-loculatum, ovula placentis parietalibus (marginalibus) affixa, anatropa; fructus ignoti.

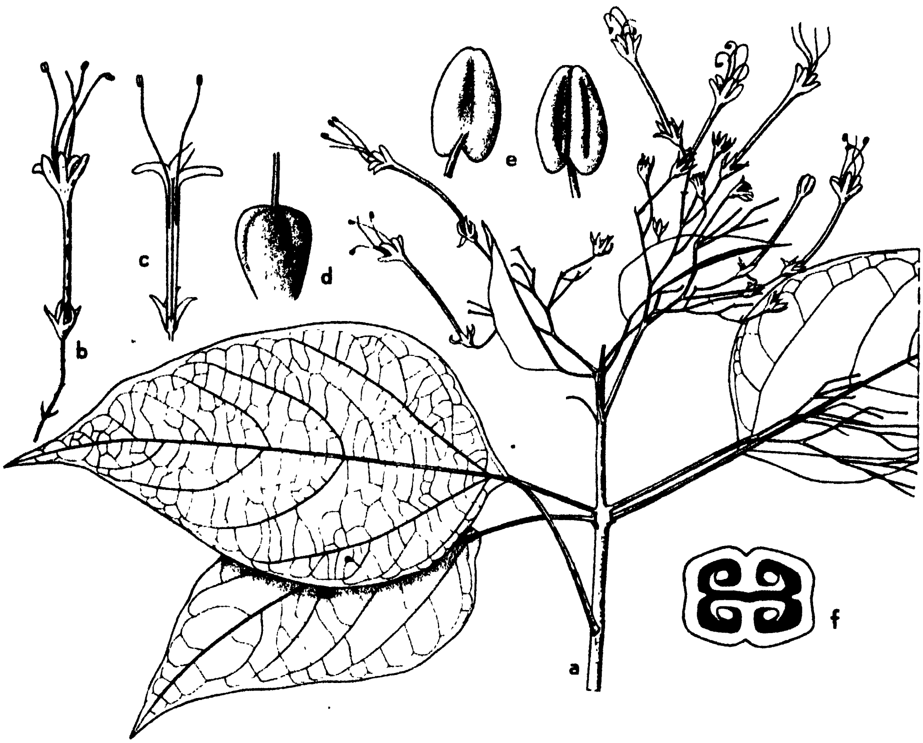

Fig. 2 — *Clerodendron populneum*, nov. spec. — a. branchlet with leaves and inflorescence; b. flower; c. id., longitudinal section; d. ovary and base of style; e. anther, ventral and dorsal sides; f. ovary, cross-section — after type specimen.

Central Division: Baroka, 20 m in alt., on savannah ridges (nr. 3781, *type specimen*).

Erect shrub 2 m high, fls. in April.

Apparently related to *C. disparifolium* BL. from Western Malaysia and with the common sea shore species *C. inerme* (L.) GAERTN., but distinguished from both by the peculiar *Populus*-like leaves (hence its specific name) and its non-exsert style; and from the latter, moreover, by its deeply laciniate calyx.

Faradaya F. v. MUELL.

1. **F. chrysoclada** K. SCHUM. — Endemic in South New Guinea.

Central Division: Mafulu, 1250 m alt. (nr. 5219).

Open spreading tree, 10 m tall, solitary on artificial grassland,

evidently left when ground was cleared for gardens; fls. yellow in Sept.—Nov.

Undoubtedly a representative of this remarkable endemic species, thusfar known only from the Astrolabe Range, Central Div. The specimen bears, anomalously, its leaves in 4-merous alternating whorls, a phenomenon also occasionally observed in other Verbenaceae e. g. *Premna integrifolia*.

For the distribution of the genus see under *Clerodendron Brassii*.

Glossocarya WALL.

1. **G. Hemiderma** BENTH. & HOOK. — Queensland, South New Guinea.

Central Division: Kubuna, 100 m in alt., in rain forest (nr. 5674).

Scandent large shrub with white flowers in Nov.

First record of this genus and species in New Guinea. The disjunct area of the genus (Ceylon, Further India, Queensland) is, however, but little filled up by the discovery of *G. Hemiderma* in Papua.

Gmelina L.

1. **G. macrophylla** (R. BR.) BENTH. — New Guinea (Okaba, Malu), Queensland.

Western Division: Wuroi, Oriomo Riv., 10—30 m in alt., in edge of rain forest and scattered over savannahs (nr. 5753).

A bushy tree, 4—6 m high, shining lvs. grey beneath, with 2 large glands at base of lamina; fls. purple pink, fr. soft red, Jan.—March.

Premna L.

1. **P. inaequilateralis** EVA BEER & H. J. LAM, nov. spec. — *fig. 3* — *Arbor* parva; *ramuli* teretes, novelli minute hirsuto-pubescentes, deinde glabrata; *folia* opposita chartacea, oblique rotundata vel rotundo-ovata, margine integra, basi oblique subcordata vel plerumque truncata, interdum paulo breviterque attenuata, apice late acuta vel obtuse acuminulata; supra sparse, in nervis supra et in lamina subtus et in petiolo densius pubescentia pilis simplicibus; 5.5—11.2 cm longa, 5—8.5 cm lata, petiolo 2.5—3 cm longo; costa cum nervis secundariis subtus paulo prominens, nervi secundarii 5—6, tertiarii transversi; *inflorescentiae* terminales, corymbosae, pubescentes, 6—9 cm longae, 10—14 cm latae, pedunculus ± 2 cm longus; bracteae lineares deciduae; *calyx* cupuliformis 0.1 cm altus, bilabiatus, uno labio bidentato, uno plus minusve undulato vel obscure 3-denticulato, extus pubescens, intus glaber, in fructu haud elargatus; *corolla* 0.4 cm longa, tubo et in medio lobis minute

adpresse pubescens, cetera petala glabra, intus fauce dense pilosa excepta glabra, bilabiata, labium superius integrum, inferius 3-lobatum lobo medio majore; *stamina* 4, vix vel haud exserta, sub fauce inserta; *ovarium* glabrum stylo vix exserto stigmate bifido.

Fig. 3 — *Premna inaequilateralis*, nov. spec. — a. branchlet with leaves and inflorescences; b. flower; c. calyx; d. corolla, opened so as to show the stamens, with pistillum — after type specimen.

Central Division: Mafulu, 1250 m in alt., common in forest regrowths (nr. 5536, *type specimen*).

A small tree of flat branching habit; fls. green in Sept.—Nov.

We are sorry that we have to add a new species to this extremely difficult genus, in which flower features are almost as vague and little distinct as those of

the extremely variable leaves. Its specific name is chosen because of the oblique leaf base, which is constant in the specimen examined.

2. **P. sessilifolia** H. J. LAM — Central Celebes, New Guinea.

Western Division: Dagwa, Oriomo River, alt. 45 m, common in rather extensive colonies on open grassy ridges (nr. 6007).

Leaves lying flatly on ground; fls. white, fragrant, fr. black, fleshy up to 1 cm diam., in Febr.—March.

The second record of this well distinguishable species in New Guinea, the other habitats being Kenegia riv. in North New Guinea and W. Celebes, where it was apparently collected at a similar locality as the present specimen.

Teysmanniodendron KOORD.

1. **T. bogoriense** KOORD. — Borneo, Ambon, Ceram, New Guinea.

Central Division: Dieni, Ononge Road, 500 m in alt. (nr. 3837).

Tall, slender tree, 30 m high, small crown; grey lenticellate bark, greenish when out; peduncles, pedicels, calyx whitish, corolla violet, fls. in Apr.—May.

This species is now known to occur in *Borneo:* West Borneo (HALLIER 3032); East Borneo, Sampit (FOR. RESEARCH INST. bb. 13944); Poerocktjahoe (Id. 10504) — *Amboina:* (FOR. RES. INST. bb. 14274) — *Ceram:* (RUTTEN 497, 1898 and 2066) — *New Guinea:* North New Guinea, Hollandia (FOR. RESEARCH INST. bb. 14560); Manoekwari (Id. bb. 15905); South New Guinea (BRASS 3837).

The genus contains a few more species, e. g. *T. pteropodum* (MIQ.) BAKH. from Sumatra, Simaloer, Banka, Borneo and the Philippines, *T. Ahernianum* (MERR.) BAKH. (cf. Journ. Arn. Arb. *16*, 1935, 74) from the Philippines and the Solomon Islands and possibly also *T. longifolia* (MERR.) nov. comb. (= *Vitex longifolia*) from Mindanao and Celebes.

SOME PRELIMINARY NOTES ON THE ALGAE COLLECTION WEBER-VAN BOSSE.

by

JOSÉPHINE TH. KOSTER.

(Rijksherbarium, Leiden).

This extensive collection, famous among algologists both of the Old and the New World, forms part of the collections of the National Herbarium (Rijksherbarium) Leiden since 1934. About fifty years ago it was started by Mrs. Dr. A. A. WEBER-VAN BOSSE (1852—hodie), an enthusiastic pupil of HUGO DE VRIES.

The colonies of *Nostoc*, living in the ditches round about the Dutch village of Doorn, evoked her admiration, which was the primary cause of an intense study in the freshwater as well as in the marine Algae. In the harbour of Den Helder North Sea Algae were collected; by collecting Algae on trips to the French Atlantic Coasts and several times to Norway (1883—1885) and further on a South African journey (1894—1895) the herbarium grew, as it did by the Malaysian specimens collected in Java, Celebes, etc. (1888—1889). During this Malaysian tour Mrs. WEBER worked in Tjibodas, where she described the new genus *Phytophysa*. In Sumatra (West Coast, Lake of Manindjau) she discovered in collaboration with her husband, MAX WEBER, a new case of symbiosis between Algae and Sponges.

However, the great enlargement came, when the successful cruise of the Siboga (1899—1900) had finished its task. The Siboga Expedition, taking a place of honour among the deep-sea expeditions, was prepared and led by M. WEBER. The chief object was to continue the work of the Challenger (1872—1876) and of the Gazelle Expedition (1874—1878), as to marine life of the Malay Archipelago, to investigate the deep sea-basins and to collect as much as possible. Mrs. WEBER seized the opportunity to collect Algae, wherever possible, picking them up along the coasts, on coral reefs and by means of the trawl. Algal vegetations, typical for the tropic seas, like those of calcareous Algae (*Halimeda, Lithothamnion,* etc.) adding to the formation of coral reefs, could be

studied and photographed. Enormous banks of *Lithothamnion* (South Saleyer, S.W. of Timor, between Celebes and Borneo) were discovered at considerable depths. *Florideae* preferring a depth, on which only scanty light penetrates, were drawn up by the trawl from depths up to 55 m.

The extensive collection of Algae from the Siboga Expedition, contains numerous new species and many new genera. It forms the material, on which four of the works on the Siboga Expedition have been based: E. S. BARTON, The genus Halimeda (1901) — A. WEBER-VAN BOSSE and M. FOSLIE, The Corallinaceae of the Siboga Expedition (1904) — A. & E. S. GEPP, The Codiaceae of the Siboga Expedition, etc. (1911) and A. WEBER-VAN BOSSE, Liste des Algues du Siboga (1911—1928). The area searched by the Siboga was the Eastern Malay Archipelago, viz. the coasts of East-Java, Lesser Sunda Islands, Moluccas, New Guinea, Talaud-, Sangir- and Sulu Islands, Celebes, S.E. Borneo and Saleyer. The „Liste du Siboga" gives an elaborate and broad survey of the marine algal flora of the Malay Archipelago. This pioneer work will always keep its value together with the collection, on which it is based. In the year 1910 the University of Utrecht honoured Mrs. WEBER by offering her an honorary Ph. D. degree.

In studying marine as well as freshwater Algae Mrs. WEBER got into contact with many well-known algologists; the results of this contact are to be found in her herbarium. So, for instance, the genus *Ectocarpus* has been revised by KUCKUCK, the genus *Turbinaria* by Mrs. GEPP-BARTON, part of the *Sargassum*'s by TH. REINBOLD, etc. A correspondence with algologists in several countries, among whom C. SAUVAGEAU, F. BØRGESEN, W. A. SETCHELL, N. E. SVEDELIUS, A. FORTI, YENDO, YAMADA, was kept up by Mrs. WEBER. In connection with her study concerning the genus *Caulerpa* (Monographie des Caulerpes, Ann. Jard. Bot. Buit. 15, 1898, 243—401) she went to Paris (ED. BORNET) and to Lund (J. G. AGARDH). The collections of the British Museum have also been visited by her.

The principle adhered to of giving on loan every specimen of her precious collection, if wanted by a serious algologist, enriched the herbarium by many important gifts in return to the kindness of its owner. A great number of *Cystoseira*'s from SAUVAGEAU, Algae from the French coasts from BORNET and THURET, Californian and other Algae from SETCHELL and GARDNER, Algae from BØRGESEN (Siam, Jamaica, etc.), Japanese Algae from OKAMURA and YENDO, Algae from the Key Islands presented by ARNOLDI, specimens from the herb. GRUNOW, original speci-

mens from G. KARSTEN of epiphyllous *Trentepohliae* from East-Java, etc. thus form part of the herbarium WEBER-VAN BOSSE.

Besides these minor acquisitions four large collections were added, viz. those of HAUCK, KÜTZING, SURINGAR and LENORMAND.

When the herbarium HAUCK was available Mrs. WEBER purchased this important collection. F. HAUCK (1845—1889), the eminent algologist, was an autodidact. After the edition of „Die Meeresalgen Deutschlands und Oesterreichs" (RABENHORST's Kryptogamenflora II, 1885) a Ph. D. degree was granted him by the University of Zürich. HAUCK spent a good deal of his life in Trieste (being a telegrapher in that town), where he availed himself of the opportunity to collect and study Adriatic marine Algae (Trieste, Cherso, Spalato, Miramar, Rovigno). When studying Adriatic Diatoms he made the acquaintance of GRUNOW, while the study of the Baltic and the North Sea Algae brought him into contact with SONDER. Specimens from several regions completed the collection, e. g. Algae from ZANARDINI (Red Sea), CUMING (Philippines, 1836—1839), A. DIETRICH (Australia), COLLINS (N. America), Al. BRAUN (Europe), VALIANTE, etc. Most of the types of HAUCK's species are extant in his collection.

After the death of W. F. R. SURINGAR, professor of Botany at Leiden, his widow sold his collection of Algae, to which had been added the precious herbarium of KÜTZING, to Mrs. WEBER. F. T. KÜTZING (1807—1893) started his career as a chemist's assistant and became afterwards a teacher at a secondary school at the German town of Nordhausen. During 1832—1833 he visited the University of Halle. The University of Giessen granted him the Ph. D. degree and in 1843 he was nominated a Royal Professor. During a trip to Italy and Dalmatia (Naples, Spalato) KÜTZING collected a number of Algae, which collection was increased by Algae from the North Sea (Heligoland, Wangeroog). The results of these activities have been laid down in his classic works: Phycologia generalis (1843, with illustrations engraved by the author), Die Kieselschaligen Bacillarien oder Diatomeen (1844), Phycologia germanica (1845), Species Algarum (1849) and Tabulae Phycologicae (1845—1871), which works had a far-reaching influence both on his contemporaries and afterwards. When examining his herbarium one is struck by the great accuracy of this algologist. KÜTZING was well aware of the value of the „type": in many of his numerous types a label is to be found on which KÜTZING has written „Originalspecimen" or „specimen authenticum". Autographic letters from well-known botanists are to be found in his herbarium, for instance from MENEGHINI (written in

1837), from REICHENBACH, together with a letter from KÜTZING himself, from Al. BRAUN (written in 1840). In the collection KÜTZING original specimens from several collectors are to be found, among whom may be mentioned: LYNGBYE, MENEGHINI, MONTAGNE (owner of a large herbarium of cryptogams from all parts of the world), BORY DE SAINT-VINCENT, C. and J. G. AGARDH, HORNSCHUCH (Austria, ± 1836), BULNHEIM (Europe), KOCH (Asia Minor, Europe, 1836—1844), FRÖLICH (Heligoland), SONDER (Australia, coll. PREISS, 1838—1842; Peru, Ceylon), BINDER (Australia), F. VON MÜLLER (Australia, Tasmania), ZOLLINGER (Java, 1841—1843), HOOKER (N. America), SCHOMBURGK (Barbados, ± 1840), KEGEL (S. America, ± 1846), COULTER (California, ± 1832), SELLOW (Brasil, ± 1819), and also the botanical explorers A. VON HUMBOLDT (Brasil), ENDRESS, and TILESIUS.

W. F. R. SURINGAR (1832—1898), who was a professor of Botany and Director in charge of the National Herbarium (Rijksherbarium), Leiden, was interested in Japanese Algae. In the part of his herbarium, that was preserved in the National Herbarium, marine Algae from Japan (sent by VON SIEBOLD, GRATAMA and TANAKA) are incorporated together with notes on its use and with water-colours, which are the originals of the illustrations in his works: Algae japonicae, Mus. Lugd. Bat. (1871), Gloiopeltis (1871—1872) and Algues du Japon I (1872), II (1874). It is to be regretted, that a number of types are missing. His *Characeae*, as well as those in the herbarium KÜTZING and in the National Herbarium, have been revised by Al. BRAUN. The genera *Cystophyllum* and *Sargassum* have been studied by GRUNOW. A number of *Algae* from the Netherlands are to be found in the SURINGAR herbarium, for a large part hailing from the collection of R. B. VAN DEN BOSCH; many of these specimens have been identified by KÜTZING, and reversely the herbarium KÜTZING contains specimens from VAN DEN BOSCH. Some of KÜTZING's species have been based on specimens sent by VAN DEN BOSCH. Algae from PELVET, Al. BRAUN, L. RABENHORST, KEGEL, ZOLLINGER, JUNGHUHN (Java), etc. completed the herbarium SURINGAR, together with several exsiccata collections.

The latest acquisition of the herbarium WEBER-VAN BOSSE was a part of the herbarium LENORMAND. S. R. LENORMAND (1796—1871), a lawyer in Normandy, lived at Vire and at Caen. Together with his friend L. A. DE BRÉBISSON (1798—1872) he made a large collection of Algae from all parts of the world (Adriatic, Canaries, S. Africa, Australia, Tasmania, Celebes, Antilles, New York, etc.). A large part of his Algae come from the coasts of Normandy, to which are added those edited

by CHAUVIN. On specimens from LENORMAND and DE BRÉBISSON species of KÜTZING have been based.

Apart from the above mentioned large collections the herbarium WEBER-VAN BOSSE contains specimens from several regions: Malay Archipelago (BECCARI, TEYSMANN, MARTENS), Ceylon (HARVEY, FERGUSON), Friendly Islands (HARVEY), New Zealand (A. D. HOOKER, BERGGREN), America (HOWE, LE JOLIS, VICKERS, NAUDIN), Europe (GRIFFITH, BATTERS, FLAHAULT, GOBI, GRUNOW, FOSLIE, LAKOWITZ), etc.

As has been stated above the whole of the collection has been presented to the National Herbarium, Leiden, which before the fusion already possessed Algae from the herb. PERSOON (WALLROTH, BONNEMAISON, LAMOUROUX), the herb. VAN ROYEN, BLUME (Java), ZIPPELIUS (Timor), KORTHALS (Mal. Arch.), HERING (Surinam), Al. BRAUN (Germany), BAENITZ (Europe) and from several Dutch collectors (VAN DEN BOSCH (some identified by L. RABENHORST), OUDEMANS, ABELEVEN, VAN DE SANDE LACOSTE, etc.).

In addition, the combined herbaria possess a number of exsiccata collections, of which the following may be enumerated:

Algae Müllerianae curante J. G. AGARDH distributae.

Algues des eaux douces de France.

ARESCHOUG, J. E. — Algae scandinavicae exsiccatae (Upsaliae, 1861—1897).

BØRGESEN, F. — Algae marinae faeroenses.

BRAUN, RABENHORST, SITZENB. — Characeen von Europa.

BREUTEL, C. F. — Flora germanica exsiccata.

CHAUVIN, J. — Algues de la Normandie (Caen, 1827).

COLLINS, HOLDEN and SETCHELL — Phycotheca Boreali-Americana.

CROUANS, H. M. et P. L. — Algues marines du Finistère (Brest, 1852).

DESMAZIÈRES, J. B. H. J. — Plantes cryptogames de France.

FARLOW, W. G., ANDERSON, C. L. et EATON, D. C. — Algae Americanae borealis exsiccatae (Boston, 1877).

Flora Austro-hungarica exsiccata.

FUNCK, H. C. — Cryptogamische Gewächse, etc. (1806—1822).

HAUCK, F. et RICHTER, P. — Phykotheca Universalis (Triest et Leipzig, 1886—1889).

HOHENACKER, R. F. — Algae marinae siccatae, etc.

HOWE, M. A. — North American Algae, collected at San Juan, Porto Rico and Coll. in Great Rogged Island, Bahamas (Herb. of the New York Botanical Garden).

Hydrophytes marines du Morbihan.

JÜRGENS, G. H. B. — Algae aquaticae (1816—1822).
Kryptogamae exsiccatae ed. a Museo Palatino Vindobonensi.
KÜTZING, F. T. — Algarum aquae dulcis germanicarum Decades (1833—1836).
LE JOLIS, A. — Algues marines de Cherbourg.
MIGULA, SYDOW et WAHLSTEDT — Characeae suecicae et danicae.
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SETCHELL, W. A. and PARKS, H. E. — Plants of Tahiti, Society Islands (1922).
WITTROCK, V. B. et NORDSTEDT, O. — Algae aquae dulcis exsiccatae praecipue scandinavicae, etc. (1877—1884).
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Dr. C. A. BACKER, *Verklarend Woordenboek van wetenschappelijke plantennamen* (Explanatory dictionary of scientific plantnames) — Noordhoff-Kolff, Groningen-Batavia, 1936 — XII + 664 — Price: flh. 19.50.

Many botanists and also sylvi-, horti- and agriculturists and almost all taxonomists are, in the course of their daily task, meeting plant-names, the exact meaning, signification or derivation of which is not immediately clear to them. Being an intelligent and studious man, he often feels the desire to know more of a name than just its orthography and so he makes a grab at one of those books written to spread more knowledge about the matter. If it is the name of a genus or of a subgenus, WITTSTEIN's „Handwörterbuch" is the book he needs, although it yields no help for genera younger than 1852 (date of preface). If it is a specific name or a latin or latinized botanical term, BISCHOFF is his man, either by his „Handbuch der botanischen Terminologie" of 1833—1844 or by his smaller „Wörterbuch der beschreibenden Botanik", of 1857 (2nd Ed.). In case these books cannot meet his wishes, on account of their age or merely out of deficiency, our present-day investigator will try to find the name in one of the more recent lists: BAILEY's „Companion for the Queensland student of plant life" of 1893; SALOMON-SCHELLE, Wörterbuch der botanischen Kunstsprache, 1904; KANNGIESSER, Etymologie der Phanerogamen-Nomenclatur, 1908 (mainly generic names); VOSS, Botanisches Hilfs- und Wörterbuch (6th ed. 1922), etc.

It is probable that in many cases the information thus obtained is either none, or at least unsatisfactory. Now the book announced here is only covering Phanerogams and ferns growing or grown in the Netherlands and in the Netherlands Indies but it may be readily accepted that this entails that it is usable for almost the whole of western Europe and of South-East-Asia. There is, however, a but, viz. in that the book is written in the Dutch language. This difficulty for foreign readers may, however, be compensated by two features; first of all by the name of the author who is known not only as one of the best connoisseurs of the Javan flora but also as a writer whose methods of investigation are exceedingly accurate and thorough; and secondly by the nature of the about 22500 items in this glossary, implying that most things can be understood with the help of a dictionary and many even without that.

I therefore recommend here with confidence this excellent book also for the use of non-Dutch botanists, horticulturists, etc. BACKER, who is an autodidact, is as keen in botany as in the comparative knowledge of languages and in history. As far as possible all names have been traced back to their very origin. Therefore BACKER is very often more than a mere recorder, since he repeatedly corrects older etymologies or wittily satyrizes ridiculous mistakes. The prospectus of this book says that BACKER for some 5 years carried a both extensive and intensive correspondence in order to

obtain biographical particulars of about 2700 private persons whose names are connected with plant-names.

The proper list is preceded by a preface and an explanation; the latter is, except for a list of abbreviations, of little use for foreigners as it mainly contains notes on the (Dutch) pronunciation. The work terminates with a list (30 pages) of the principal author's names, their abbreviations and — as far as not mentioned in the main list — a short elucidation. The result of all this painstaking work, accomplished with the help of many, is a splendid book, which I would also like to see in the hands of all foreign taxonomists, for their own profit as well as for the fame of the botanical research in the Netherlands and its colonies.

Few people indeed will have the patience and the perseverance to go through an almost endless number of publications, ancient and recent (many of which being, moreover, by no means easily attainable), and to do it so thoroughly that, apparently, very few names are omitted, and that those inserted are accurately checked.

H. J. LAM.

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W. FEEKES, *De ontwikkeling van de natuurlijke vegetatie in de Wieringermeerpolder, de eerste groote droogmakerij van de Zuiderzee* (The development of the natural vegetation in the „Wieringermeerpolder", the first large land reclamation of the Zuyder Zee; doctor's thesis) — Nederl. Kruidk. Arch. 46, 1936, 1—294, with maps, figures and plates (text in Dutch).

This investigation, being a part of the program of the Committee for the botanical investigation of the Zuyder Zee and environment, established by the Netherlands Botanical Society, was carried out during the years 1931—1935, with the purpose to study the development of the natural vegetation on the new land, concerning matters of biological dispersal, sociology and floristics. The polder, which was dammed up in the years 1927—1929, was reclaimed in 1930 and has an area of 200 km².

This new land consists of diluvium in the N.E. part and is further formed by old marine clay („fossil" saltings), divided into two parts by a „fossil" muddy shallow. Soon immigration of Angiosperms into the new land was stated; characteristic processes were the projection of vast populations of *Aster Tripolium* from foci on the coast and also aggregation of seedlings around the mother plants. Moreover, the sea bottom before reclamation was not at all a virgin one, as was proved by the examination of soil samples, which may be explained by the action of seawater as a means of transportation of seeds from the neighbouring coasts over great distances. On the other hand, the salinity of the soil must have been the factor to set bounds to the establishment of several species, which fact, however, considerably clouded the insight in the local migration conditions. Therefore experiments on germination and on mortality of germs were carried out. Rainwater appeared to be responsible for the transport over small distances only.

The number of anemochores was not so great as could be expected; only with extreme anemochores as *Aster Tripolium, Senecio vulgaris, Phragmites communis,* the action of wind was really effective. So it was in several *Chenopodiaceae* which form

„rolling plants". Transportation by birds also played its part (species near the fresh-water wells; introduction of plants from the dunes). The number of anthropochores was particularly large (93 species). The author found himself to have unintentionally carried with his clothes and boots on 11 trips in the polder about 2000 diaspores, belonging to 57 species! The total amount of Angiosperm species occurring in the polder up to 1934 was 354; 221 more species, known from the neighbouring country, did not penetrate into the polder. Many of these species are rare in the surrounding regions or do not possess effective means of dispersal. The others may be considered as kept away by the salt. In the beginning the number of annual and biennial hibernating species was high, later on the number of hemicryptophytes and especially of geophytes increased. Of the 261 naturally introduced species 50 developed socially; only a small number of these became dominant and covered vast areas: *Aster Tripolium, Atriplex hastatum, A. littorale, Suaeda maritima, Senecio vulgaris, Poa annua.* Several species in the polder showed a remarkable polymorphism, e. g. *Salicornia herbacea, Spergularia salina* and *Aster Tripolium.* Of *Salicornia herbacea* 16 forms are described and partly pictured; 3 subspecies could be distinguished, viz. *stricta* DUM., *ramosissima* WOODS and *arborea* FEEKES. Dominance of a small number of species over large areas was very striking in the first vegetation (investigated according to the Netherlands-Scandinavian method), as has been often stated in similar conditions.

In the succession a hydroseries and a xeroseries could be distinguished (Scheme I, p. 105—107); the hydroseries consisted of *Chlorophyceae* and a few Angiosperms; the xeroseries could be subdivided into 1. a stage of *Cyanophyceae* and *Diatomeae*, 2. a stage of annuals, 3. a stage of species of more generations pro year and of biennials and perennials, 4. the natural pasture. Maps show the situation of the associations. The species-area curve of the vegetation corresponds with the formula of ARRHENIUS, except in very salty habitats, where the saturation curve of KYLIN was found. The frequency curve culminates in the sporadical species; on early desaltated habitats a second culmination point is found in the most frequent species. By early desaltation less diaspores are kept away. Especially the uppermost layers of the soil are of importance for the development of seedlings. The dominant halophytes appeared to be more or less hygrophytic in their seedling-stage, viz. *Aster Tripolium, Suaeda maritima, Salicornia herbacea, Atriplex littorale, A. hastatum.* On dry, quickly desaltated soil the annual halophytes seldom formed associations. Curves show the correlation between the occurrence, the average and the maximum degree of covering of the simple associations and the concentration of salt in the layers of 0—10 and 10—25 cm. In scheme II, p. 188, the degree of salt tolerance of a number of species is indicated. The selection of ecotypes may appear to be important for judging the sequence in the scheme mentioned.

A further factor of importance was the nitrogen. The first nitrophilous vegetation, being very luxuriant, was followed by a much less vital one. It was striking that several halophytes of the surroundings did not occur in the polder. Perhaps the factor N is giving the explanation here.

Bryophytes appeared especially after heavy rains and often suddenly covered large areas. Diversity in salt tolerance is also evident in several mosses. Bryophytes found in the polder are enumerated as are the Fungi and Algae.

The fauna of the new land was also submitted to a discussion. Typical for the new land was the appearance of large quantities of certain species of insects.

A separate chapter is devoted to the results of these investigations useful for practice.

It may be of interest in connection with the future reclamation of other parts of the Zuyder Zee to study the question whether and how far the first vegetation can be tolerated in other projected polders and how far the dispersal of the species could prognosticate about the nature of the soil.

S. J. VAN OOSTSTROOM.

B L U M E A

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BOTANICAL RESULTS OF A TRIP TO THE SALAJAR ISLANDS

by

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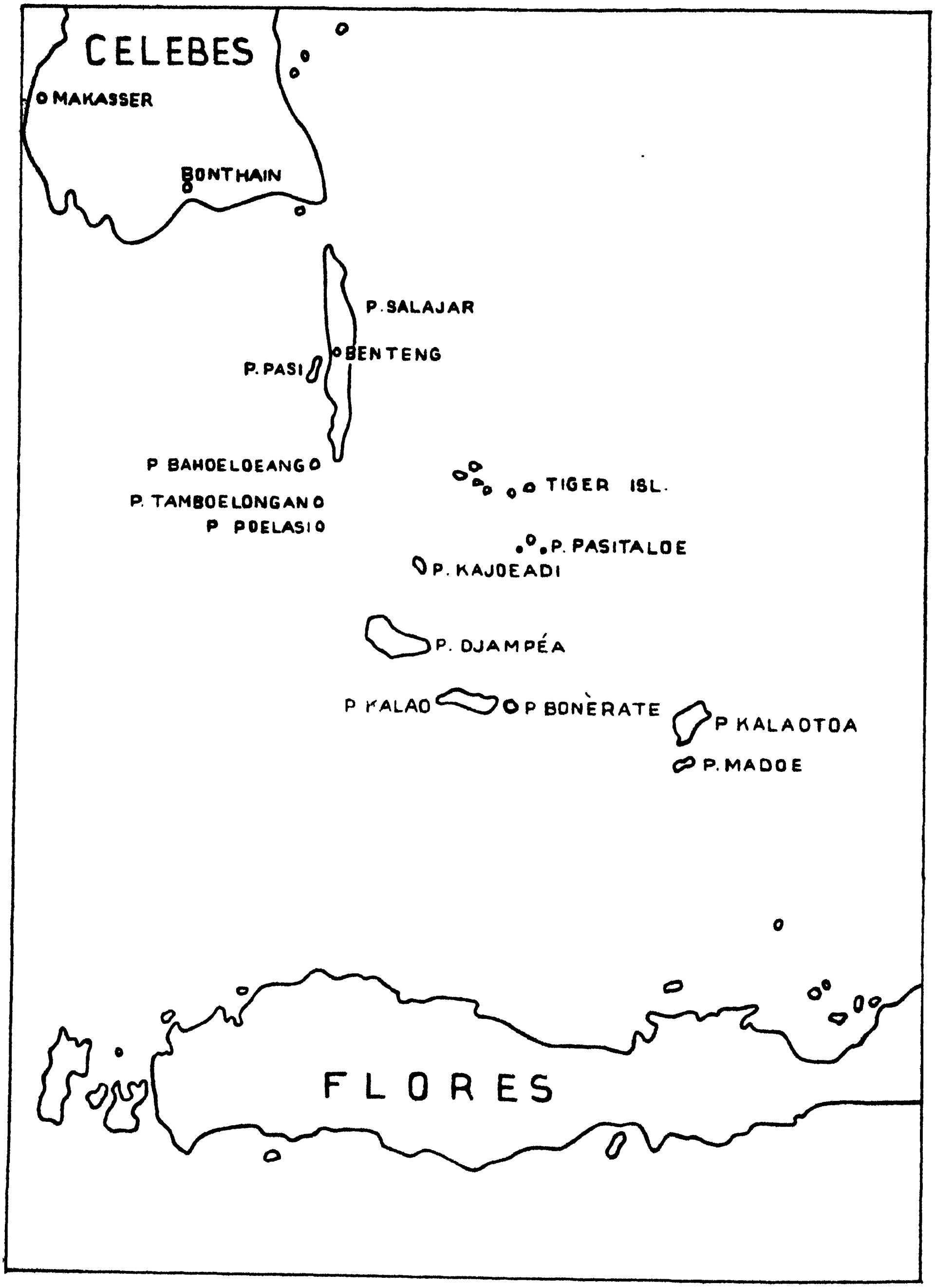
1. INTRODUCTION.

The Salajar Islands strew the Flores Sea between Celebes and Flores. The group consists of no less than 73 smaller and larger islands. The principal islands are: Salajar or Tanadoang, Djampea, Kalao, Kalaotoa, and Bonerate. A number of smaller islands form together the group of the so-called Tiger Islands, and to the south of them are the very small, low Pasitaloe Islands. The Salajar group is situated between Long. 119°50′ E. and 121°30′ E. and between Lat. 5°36′ S. and 7°25′ S. See the map on p. 240.

In May 1913, I was enabled to visit this territory, thanks to a financial allowance of the „Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën" (Society for the Promotion of the Scientific Investigation of the Netherlands Colonies), for short: „Treub Society", and also of the „Provinciaal Utrechtsch Genootschap voor Kunsten en Wetenschappen" (Utrecht Provincial Society for Arts and Sciences). The publication of the present paper was enabled by financial support of the „Leidsch Universiteitsfonds" (Leiden University Fund). I beg to tender my best thanks for all this valuable support here.

So far I did not come to giving an account of this trip and its botanical results. I nursed hopes to get an opportunity to pay another visit to these islands for completing the investigations. This opportunity, however, has never come, and at present a visit is altogether out of the question. Therefore I think it best now to record what I found in 1913. General surveys of the flora of many parts of the Malay Archipelago are as yet lacking, and for the present there is not much chance that an investigation will be made into the vegetation of these islands by somebody else. It may be, however, that if this yet might happen, my reconnaissance trip may serve as a basis for a more extensive inves-



P. = Poeloe = Island. Oe pronounce u.

tigation. This paper therefore is a description of the conditions observed at my visit in 1913. The conditions of the smaller, thinly populated islands will be the same as in those times. The main island Salajar was densely populated; remnants of the original vegetation where only to be seen here and there; very likely not much is left of them now, but for the sparsely populated southern point of the island.

Apart from the above-mentioned societies I also owe many thanks to the late Mr E. E. W. G. SCHRÖDER, who at the time of my visit was district-officer for the section Salajar. He accompanied me on my trip to the smaller islands and assisted me by word and deed. I also was his guest during my stay in Benteng, the capital of Salajar.

The governor of Celebes placed a Government steamer, the „Reiger", at the disposal of the expedition, since the district-officer wanted to pay an official visit to the various islands belonging to his province. If we should not have had the disposal of this ship, we should have been compelled to make the excursions by sailing-proah, in which case much time would have been lost. The late Mr W. A. PÉNARD, official of the Encyclopedic Office at Batavia, also joined the excursion for studying the country and its population.

My botanical materials were incorporated in the Herbarium of the Utrecht University, where they were identified provisionally. Afterwards the plants were classified by Dr. J. G. B. BEUMÉE, at that time assistant, later on Director of the Herbarium at Buitenzorg. Besides he gave me a numbered list of the plants found in Salajar by J. E. TEIJSMANN, part of which only was classified, and also a list of the plants collected by H. ZOLLINGER in the same island. The collection of TEIJSMANN consists of 233 numbers, 6 numbers are known from ZOLLINGER. I myself brought 653 numbers from the various islands together. I do not conceal that thus only part of the flora is reconnoitred. The time of one month, which I had at my disposal, was too short for a thorough investigation of these islands situated so far apart. A great part of the available time had to be spent travelling. Here and there investigations could be made only at random. By the side of Phanerogams and Pteridophytes I made a collection of *Polyporaceae*, which are equally kept in the Herbarium at Utrecht. I also collected a great number of Zoocecidia, A part of them have been described in 1916 (W. und J. DOCTERS VAN LEEUWEN - REIJNVAAN, 1916, p. 21); the descriptions of the remaining galls have been included in a larger, general work on the galls of the Netherlands' Indies (J. DOCTERS VAN LEEUWEN - REIJNVAAN and W. M. DOCTERS VAN LEEUWEN, 1926).

Short articles about part of the excursion and the vegetation appeared in serial form in the daily paper, the „Locomotief", at Semarang in 1913.

2. FORMER INFORMATION ABOUT THE VEGETATION.

A few investigators have visited these islands, H. ZOLLINGER [1]), a Swiss botanist, who stayed in the Netherlands Indies for some considerable time, and J. E. TEIJSMANN, the curator of the Botanic Gardens at Buitenzorg, who travelled a good deal in the Malay Archipelago in order to collect living plants and herbarium materials. Besides these, shorter and more extensive reports about the vegetation have been made in writings of missionaries or officials who visited these territories.

H. ZOLLINGER (1850, p. 1) stayed in Salajar from July 2nd to 5th, 1847. About this visit he wrote as follows: „As far as I know Salajar has not yet been visited by any natural scientist, at least nothing has been published about it. But since such a person will never be sent there on purpose, one will not take it amiss if I report about this island here, and will not return to this point in the future." He climbed the top of the highest mountain of the island, the Bontanoharoe, which he mentions as being 1900 feet high. The food of the population consists mainly of maize and rice, grown on dry grounds. Besides these they grow many coco-palms and also cotton. *Arenga pinnata, Canarium commune* and tobacco are also found a good deal. Otherwise he does not mention anything about the vegetation or about making a collection. A few of the plants brought back by him occur in the „Systematisches Verzeichniss", others were found in the Herbarium at Buitenzorg.

J. P. FREIJN (1850, p. 16), who stayed in Salajar in 1848, only mentions the occurrence of many coco-palms. W. H. DONSELAAR (1857, p. 227) gives more particulars. Good timber is found in Salajar, and also ebony, but the latter only of smaller dimensions. Quite common are capok (*Ceiba pentandra*) and various species of bamboo, *Canarium,* millet (*Setaria viridis* var. *italica*), maize, cotton, and some coffee; tobacco and indigo are also grown. J. A. BAKKER (1862, p. 215) visited the islands Bonerate and Kalao. In Bonerate timber is not found in

[1]) A biography of this able naturalist appeared in „Mitteilungen der Gruppe Niederländisch Indien der Neuen Helvetischen Gesellschaft", Vol. VIII, no. 2, 1929, Buitenzorg. Dr. EDMUND SCHEIBENER gave a short biography of H. ZOLLINGER, Dr. D. F. VAN SLOOTEN sketched him as a botanist and described his importance for the knowledge of the Javanese flora.

great quantities, but fire-wood is, because the ground is covered for the greater part by brush-wood; in between occur open places covered with a species of tenuous grass. Probably *Andropogon contortus* is meant here, since this grass still covers vast areas. As to Kalao BAKKER only communicates that it is covered with wood. VAN DER STOK (1866, p. 398) furnishes more data; he says of Salajar that the flora is richly represented, notwithstanding the slight precipitation. Of the plants he mentions *Pandanus, Canarium,* one species of cactus (*Opuntia*), and *Liliaceae.* Many *Excoecaria* trees and *Nipa* palms grow in the marshes, and in the higher parts are found vast wildernesses of brushwood. Still higher the vegetation becomes sparse; *Cassia Fistula, Artocarpus incisa,* and *A. integra, Dodonaea viscosa,* and *Ficus Benjamina* are recorded. In the vast grass wildernesses formed by *Imperata cylindrica,* are found species of *Labiatae, Euphorbiaceae, Rubiaceae,* and ferns.

Of the plants grown and used by man VAN DER STOK mentions: Coco-palms, *Zea mays,* millet, rice, sugar-cane, *Coffea arabica,* species of *Dolichos,* tobacco, *Tectona grandis, Gossypium* species, *Corypha Utan, Diospyros Ebenum* (particularly in Bonerate and Kalao), *Arenga pinnata, Piper betle,* species of bamboo, *Calamus, Opuntia, Morinda citrifolia, Psidium Guajava, Annona muricata, Punica granatum, Ananas comosus, Capsicum annuum,* species of *Dioscorea,* species of *Musa, Mangifera indica, Carica Papaya,* many species of *Amarantaceae, Cucurbitaceae, Maranta arundinacea, Metroxylon* species, *Cycas Rumphii, Uncaria, Terminalia, Ricinus communis, Jatropha Curcas, Manihot utilissima, Datura Stramonium, Hibiscus tiliaceus, Curcuma domestica, Zingiber officinale, Alstonia, Ocimum gratissimum.*

VAN DER STOK observed the most luxurious vegetation in the southern part of the island Salajar.

TEIJSMANN (1879, p. 111) made an excursion to Celebes and the surrounding islands in 1877. He also collected in Salajar. He stayed in this island from November 16th to December 11th. Owing to barrenness, in consequence of a long period of drought, the vegetation fell short of expectation, and for want of uninjured woods only little could be collected. Of the flora he mentions: Coco-palms, *Cassia Fistula, Borassus flabellifer,* and *Corypha Utan.* On the highest parts of Mt. Bontanoharoe TEIJSMANN found *Mangifera indica* run wild, and *Vitex trifolia* as a hedge plant.

ENGELHARD visited the islands, and about this visit several reports were published. In the first (1884 a, p. 306) only a few cultivated plants are mentioned, viz. *Nipa, Arenga, Metroxylon,* and *Borassus.* In

a more extensive publication (1884 b, p. 263) he says that virgin forests are no longer present in Salajar; remnants can only be found near the top of the Bontanoharoe and in the region south of Barang-Barang. Small teak-forests are still found here and there in the regencies Balaboelo and Lajolo. They have been planted by order of the Governor of Celebes, CORNELIS SINTELAAR. These experimental plantations were made in 1735 from seed originating from the island Boeton and from Bima. According to ENGELHARD original teak-forests must still be present; he himself, however, has not seen them. Virgin forests of any importance do no longer occur in the islands Pasi, Bahoeloeang, Tamboelongan, Poelasi, and Kajoeadi. The islands Djampea and Kalao, on the other hand, are still covered with virgin forests. In Djampea are still vast mangrove-forests which have developed to a smaller extent in Salajar.

This is what I have found on the older stages of the vegetation in these islands.

In the islands was a well-developed banana cultivation, the fruits were exported mainly to Makassar. In 1914 and 1915 complaints began to be heard about a serious disease which pretty well destroyed this cultivation. In 1915 the islands were visited by an official of the Institute for plant-disease (Phytopathological Service) at Buitenzorg, A. B. RIJKS; he reported about this visit, and this report has been published (1916, p. 1). He states that in 1880 the population numbered 75000 souls, who, for the greater part, were living in the main island Salajar. Agriculture is still in a very primitive stage; Kajoeadi and Djampea, however, formerly had a rather extensive banana cultivation. The main food-plant is maize, and in all the islands coco-palms are grown. A really popular cultivation was formerly that of cotton (*Gossypium* species); this cultivation, however, has been abandoned altogether, and the plant is now only found run wild. It stands to reason that the greater part of the report is taken up by a discussion of the banana disease, which did a great deal of harm to the plantations. The disease is an affection of the vascular system. In case of serious affection the plant is hardly able to develop.

3. GEOLOGICAL CHARACTER AND CLIMATE.

Few details are known about the geological nature of these islands; many islands have not been examined at all. WICHMANN (1895, p. 236) has described stones of Salajar, and further data may be obtained from an article by VERBEEK (1908, p. 31), who has examined Salajar and a

few other islands. In the geological lectures of RUTTEN (1927, p. 550) a short survey is given of what is known about this subject.

Salajar consists of a kernel of tufaceous sandstones and marls, sloping westwards, with on top very young corallites. Those which are found highest are probably the oldest. From west to east the level slopes over long ranges of hills up to the highest parts, only to go down steeply to the sea on the east side. ZOLLINGER and with him WICHMANN wrongly considered the highest top, the mountain Bontanoharoe, to be late eruptive. According to VERBEEK the mountain consists entirely of sandstones with interjacent andesite breccia. The limestone wall surrounding the island, which in parts is up to 80 m high, is interrupted wherever small rivers empty themselves into the sea. VERBEEK is of opinion that all the limestone depositions are late-Miocene. At the mouths of the rivers are found small areas of alluvion with mangrove vegetations.

The other islands too consist for the greater part of limestone rocks; the smallest are coral islands. The islands Tamboelongan and Poelasi consist, according to VERBEEK, of eruptive materials and raised coral reefs, which are not higher than 10 to 15 m.

VERBEEK saw Djampea only from a distance; he is of the opinion, judging by its shape, that it consists of eruptive rocks and breccia, may be from old corallites. WICHMANN described the stones brought back from this island by the Siboga expedition as granite and syenyte-porphyry, stones such as, RUTTEN remarks, would not have been expected in an island so near Salajar. But, he says, time will show whether this really is an old massive formation or that these plutonic rocks should rather be compared to tertiary granites, which have been known for some years as occurring in Flores.

The soil, where it is cultivated, is on the whole strongly washed away, and denuded of its humus. Only close to the sea good cultivation areas can still be found. In many islands the soil consists of hard coral substance, with between the projecting coral peaks patches of arable land. The result is that the areas which are no longer cultivated are overgrown for the greater part with grass vegetation and tenuous shrubs. The original wood too shows the luxuriousness of a real virgin forest in but a few places. RIJKS (1916, p. 3) also calls the soil rather poor with the exception of a few parts of Salajar and Djampea. In Bonerate the soil is extremely barren. In order to plant maize the inhabitants first have to dig holes in the limestone rocks and to fill these up with soil from lower, more fertile parts of the island.

The rainfall is not very great and rather equally divided over the months from November up to June inclusive, the other months being the dry monsoon. Raingauges are placed in Benteng, the capital of Salajar, and in Batangmata, situated half way between Benteng and the northern point of the island. Up to 1917 a pluviometer could be found in the island Bonerate, but in that year it was removed to the island Djampea. The figures of the rainfall were given to me by Prof. J. BOEREMA, director of the Meteorological Observatory in Batavia, for which I take pleasure in tendering him my thanks here. Below follow the said figures:

	Jan.	Febr.	Mrch	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
Salajar 1913–'33	152	133	157	168	220	135	45	14	12	26	101	192	1355
Batangmata 1922–'33	118	88	99	151	178	142	53	8	5	16	90	130	1078
Bonerate 1913–'17	346	245	257	111	203	113	35	13	10	24	203	351	1911
Djampea 1917–'33	228	192	184	87	96	52	19	9	21	28	80	198	1194

The measurements of Bonerate and Batangmata cover too short a time to yield a trustworthy average. RIJKS gives the average rainfall of the years 1909 to 1913 as regards Bonerate, and records as annual 1327 mm. It seems as if between 1913 and 1917 there must have been one or more years with a large rainfall.

The main of these two figures is 1619. BRAAK (1922, p. 460) gives an average over 9 years of 1596 mm. He also records that the islands Salajar and Bonerate have a lively air motion, and from that it follows that the drought is of great influence.

4. SHORT DESCRIPTION OF THE EXPEDITION.

On April 30th the ship of the Royal Dutch Navigàtion Company, which has taken me on board at Makassar, sails just before sunrise past the south coast of Salajar. The ranges of hills are clearly visible. At half past five the ship casts anchor in the bay between the main island and the small island Pasi. The district officer (Indian Civil Servant), Mr. E. E. W. G. SCHRÖDER meets me at the boat and receives me hospitably in his spacious house. The day of arrival and the next few days are spent with reconnoitring the neighbourhood and preparing the collecting materials for the trip by Government steamer. The „Reiger"

arrives in the roads in the afternoon of May 2nd and the actual trip begins the next day. We first sail round the northern side of Pasi, and then again to the south over a dead smooth sea, between the south point of Salajar and the island Bahoeloeang, and next to the east of the islands Tamboelongan and Poelasi towards Kajoeadi. The first mentioned island displays along its coast a dense plantation of coco-palms, the ridge is covered with thin forest, and on the slopes we discern maize plantations and also a few lontar palms: *Borassus flabellifer.* With a field-glass we can recognize a few beach-plants such as *Ipomoea Pes-caprae* and *Spinifex littoreus,* growing on the sandy beach in front of the coco-nuts. The southern point of Salajar is densely covered with wood, and a few campongs are surrounded by coco-palms. On the most southern end, where the range of hills steeply descends down to the sea, we see behind the beach a few groups of *Casuarina equisetifolia.* The islands Tamboelongan and Poelasi have been disforested almost completely, on the southern side are slightly more trees than in the north and east parts; the naked, red-coloured hills project above the coco-palms, they bear only here and there a sparse vegetation of grasses and low shrubs.

In the afternoon the ship drops anchor at the west side of the island Kajoeadi; the island is surrounded by a coral reef which stretches far into the sea, and therefore we are rowed ashore. This coast, particularly the northern part, consists of limestone rocks with shallow caves. A large block, fallen down from these rocks, and now bathed by the sea, bears a Composita with fleshy leaves and beautiful, purple capitula: *Vernonia actaea.* The southern part has a sandy beach, covered with many beach plants. We walk along the beach, through the coco plantations and the campong. Everything looks extremely neglected. Through badly kept banana and maize plantations we walk some distance up the hill, the Tandjoenglipang. Up to the highest top it is pretty well bare. Finally we return to the ship.

May 4th. At half past five we go again by barge to the shore, and walk through the campong, the neglected coco, banana, and maize plantations towards the north, in the direction of the hill called Bonêlambèrê. Behind the plantations we find a thin wood with small trees and a few lianas; but few plants are flowering. The soil consists of coral stones, which project with sharp points above the thin layer of humus, and which render walking very difficult. Then back to the ship again, which leaves at 10 o'clock. We sail to the north east of the largest island Djampea and to the north of Kalao, and by 5 o'clock we arrive at the west side of the island Bonerate. The northern coast of Kalao is steep,

and full of grottos and fissures, and towards the east is a reef of stones, projecting above the sea, but entirely bare. The coast of Bonerate is equally steep, and consists of rocks bearing an extremely sparse vegetation. An official of the Civil Service, residing in Bonerate, comes on board in order to accompany the trip some way.

May 5th. At 5.30 a.m. the ship sails past the south side of Bonerate towards the most easterly island of the group, Kalaotoa. We arrive at the island at 2 o'clock, and the ship casts anchor at about one hour's rowing away from the west coast; we disembark near a small campong, and look for plants in the neighbourhood.

May 6th. The boat is brought up again near the same campong; I make an excursion into the hills with 15 coolies. We first pass through neglected arable land, where here and there maize, *Ricinus*, and other field-produce is grown, and penetrate through again deserted parts which are covered with thin, young wood. Through thin forest up to the top, which is about 320 m high. We return to the campong by a steeper way, and go back to the ship with a small proah. A swarm of white butterflies (*Pieridae*) moved in the morning along the west coast from south to north, thus forming a long, white ribbon, which in the afternoon had become less dense, but which still went on. This phenomenon only ended by nightfall.

May 7th. The ship sails at half past five between Kalaotoa and the southern, neighbouring, smaller island Madoe in order to observe the shape of the mountain, and then returns to Bonerate. We pass along the steep north coast of this island, arrive at 2 o'clock at the west side, and are rowed ashore. As has been said before, a civil servant resides in this islands, and the consequences are clearly visible. The campong looks very trim and neat, with well-kept roads and houses with compounds. We collect plants in the surroundings, and return to the ship after sunset. From the house of the civil servant an avenue of a species of large *Ficus* leads almost down to the sea; the trees are full of glow-worms, which emit their light and go out simultaneously. We go back by proah across a strongly phosphorescing sea.

May 8th. In the morning we make an excursion to the hill, which is about a hundred meter high, through neglected arable land and low brushwood, with alternate stretches of grass. At 12 o'clock we are back on board the ship, which sails to the Pasitaloe islands. These are small, low coral islands. In one of them is a campong, consisting of only a few houses, and around it a few patches of arable land. Otherwise, however, these islands are only covered with small trees and beach plants.

May 9th. By sailing barge we go to the western island of the Pasitaloe group; it is about 1 kilometer long and half a kilometer broad. Although there are no houses in this island, the soil in the middle part is yet cultivated. In the afternoon the „Reiger" sails to the island Kalao. From the ship we see on the north side a light-coloured teakwood stand out against the surrounding vegetation. We make for this wood, and ascend the slope. The wood stretches from the coast to a height of about 50 m. Between the teak trees was very much brushwood, but only few plants were flowering. Later on we return to Bonerate, where the district officer has to look after some government affairs, and May 10th we spend before the coast.

May 11th. Early in the morning we sail to the almost unvisited south coast of the island Kalao; we are set ashore on a narrow, sandy beach, near a small campong. The coast consists of limestone full of grottos, and behind a narrow girdle of beach plants we find a rather dense virgin forest. We walk in a western direction, and encounter coral rocks, which end in the sea, so that we have to wade through the water for quite a long time. Here and there are small, sandy patches of beach. The excursion comes to an end at a large campong; we are rowed back to the ship, and then sail to the largest island, Djampea.

May 12th. The ship rides at anchor in a large bay to the south west of the island; we are rowed in to shore near the campong Marégé. Together with 24 coolies we make for the interior of the island, first through coco plantations, then through *Imperata* wildernesses, which are surrounded by high forest. Everywhere we see trails of deer, and here and there wild boars are startled. The wood into which we penetrate next consists of heavy trees, with much growth of rattan; the plants climb high up in the trees, and long festoons lie over the ground, so that a wilderness has arisen into which it is hardly possible to penetrate. The trees stand rather far apart, and the shade is not very dense, but yet the growth of plants seems to be hampered by other causes. But for rattan there is very little undergrowth. We soon reach the hills, and climb gradually upwards. After about 4 hours' climbing we reach the highest top, some 500 m high. The greater part of the coolies and my plant-collector have been left behind on a foretop in order to put up some accommodation for the night. On the top are large stones, which bear here and there specimens of a white flowering *Begonia*. There are more specimens of *Asplenium Nidus* here than on the slopes. The entire wood is strikingly poor in epiphytes and flowering plants. In the meantime a tent has been put up on the foretop; we return to

this point, take some lunch, and then decide to go back to the ship, since the scarcity of flowering plants renders a longer stay unnecessary. There was one exception: a huge liana, *Mucuna gigantea,* was flowering everywhere. The inflorescences with the yellow-green papilionaceous flowers hang down by long, thin peduncles, from the crowns of the trees to about 1½—2 m above the ground.

May 13th. The ship sails past the south coast towards the east, and we are rowed ashore at the campong Pekangkang; from here we first walk in an eastern direction along the coast, partly we sail by praoh through a marvellous mangrove forest, then we sail some distance up the river Elè Lampa, and next walk towards the campong Paromana, which is situated on the south-eastern point of the island. From here we walk right across the island towards the campong Oedjong on the north coast. The territory we pass consists for the greater part of neglected maize fields, woods which have been cut down, and mainly *Imperata* wildernesses. The ship has sailed past the east coast, and now rides at anchor before Oedjong.

May 14th. With a few coolies I make an excursion to the west side, through vast *Imperata*-fields towards the hills, and to one of the many tops, some 300 m above sea-level. Here we find a beautiful virgin forest; the undergrowth, however, was very poor.

May 15th. The ship sails in a westerly direction, and we go ashore near the campong on the north side, Boné Lambĕrĕ, where all men are absent. Finally we find a few persons who bring us through endless *Imperata* fields to the wood. A path has to be cleared; this detains us a long time owing to the rattan wildernesses. We pass by a clear brook, but nor is here the vegetation any richer than what we have seen so far. We climb up to the 300 m level, and then descend through other parts; here also virgin forest and many *Imperata* fields. We arrive in the west side near the campong Benteng; the ship lies in a large bay surrounded by islands.

May 16th. We go ashore and walk along the beach and through the vast mangrove, which consists mainly of species of *Bruguiera,* species of *Rhizophora,* and *Sonneratia*; the *Bruguieras* particularly had developed into robust trees with enormous aerial-roots.

May 17th. Overnight the ship sails back to Salajar, where we arrive at 5 o'clock in the afternoon.

The next few days are spent with arranging the collections, and making preparations for an excursion to the mountains of Salajar.

May 20th. With many coolies we leave early in the morning; the

way first leads through coco plantations and mangrove forests, and along shaded roads into the hills. The vegetation gradually becomes richer, but yet it is a poor remnant of what formerly it must have been. By 12 o'clock we arrive at the pasanggrahan (Government resthouse for visitors), where we stay a few days in order to collect plants in the neighbourhood. The pasanggrahan is situated at an altitude of about 300 m, just above a campong Bitombang, so that the surroundings are cultivated for the greater part. At the back of the house we have a view of the highest mountain of the island, the Bontanoharoe.

May 22nd. We continue our way upwards, and after a few hours' climbing a long steep paths we reach the top of the Bontanoharoe, about 600 m above sea-level. On a ridge, covered with grass, between remnants of the virgin forest, is a small hut, from where we have a beautiful view of the west side of the island. The top itself is flat, and covered with wood, with alternate grass and shrub wildernesses. *Psidium Guajava* has run wild everywhere and is fructifying amply. In the evening the wild boars feast upon the fallen fruits. Towards the east coast the country goes down steeply, and the slopes bear but little vegetation. This part of the island is richer in plants than any other visited so far. For several days we make excursions and collect as many plants as possible.

May 25th. We go back to Benteng along a ridge running in a north-western direction; at first the way leads down gradually, but nearer to the plain the slope becomes steeper. The ridge is very narrow, with on both sides perpendicular walls; everything is quite white owing to the limestone; the growth of plants is extremely poor.

May 26th. This day is spent with preparing an excursion to the southern point of Salajar; the chief of a campong there, of Barang-barang, goes home to-morrow by proah, and I may join him.

May 27th. In a small heavily laden flying proah we leave Benteng early in the morning, at first rowing, later on by sail. We sail close under the west coast, which consists of steep limestone rocks bearing many *Pandanus* and *Cycas*. The sea undermines the coast, everywhere are caves, and large blocks of rock lie spread in the sea. Halfway, at campong Tiele-Tiele, we take a heavier proah and before long we are sailing again southwards over a rough sea. At half past six we reach the campong Tonkè-Tonkè, from where we reach Barang-Barang after a quarter of an hour's walk. We put up our camp-beds in the house of the chief of this campong, and soon retire behind the mosquito-curtain, for this part is known for its many mosquitos and malaria.

The next few days we make excursions in the neighbourhood, and

amongst others right across the island towards the east side, where a few small campongs are situated, Bonesela and Pinang. The greater part of the south point is covered with thin wood and along the coast here and there with mangrove forests.

May 30th. We leave at 8 o'clock in the morning sailing before a stiff breeze, and thus we reach Benteng at half past two.

The next days are used for packing everything; we have to wait three days for the steamer of the Royal Dutch Navigation Company, which was expected on June 1st, but which did not arrive until June 4th, at 6 o'clock in the afternoon. At night we sail for Makassar, and there the trip came to an end.

5. THE ISLAND OF SALAJAR.

ENGELHARD (1884 b, p. 263) records that this island is 635 square kilometers large, the population being about 80 000. This rather dense population is cause of the fact that the greater part of the island is cultivated, or consists of deserted arable land. The original vegetation can still mainly be found in the thinly populated south point and along the coasts. The sandy beach, which occurs here and there, is covered with the ordinary beach plants: *Ipomoea Pes-caprae, Euphorbia Atoto, Cassytha filiformis, Caesalpinia Crista, Canavalia maritima, Desmodium umbellatum, Wedelia biflora,* and *Spinifex littoreus.* In some places where the beach is somewhat wider, and where small dunes have developed, occur dense wildernesses of *Caesalpinia Crista, Pandanus tectorius,* and *Opuntia* species, which are pretty well impenetrable. The steeper limestone beaches bear mainly *Cycas Rumphii, Pandanus tectorius,* and the *Vernonia* with fleshy leaves, *V. actaea,* which is mainly found close above the sea. A shrubby *Euphorbia, E. plumerioides,* is common on calcareous coasts on the east side of the southern point of the island.

A mangrove vegetation has developed at the mouths of rivers on the west side of the island and in moist, muddy parts along the coast. It is not rich in species, and the population has cut down a good deal. *Avicennia officinalis* formed on the inner side of the actual mangrove small dense groves; full-grown specimens were rare; there were also here and there dense groves of *Excoecaria Agallocha.* I failed to find any well-developed *Barringtonia* association, although various representatives occurred along the coasts of this island.

Everywhere behind these formations are plantations of *Cocos nucifera,* sometimes wide, sometimes narrower strips, and this palm is also

cultivated by the population in the interior even quite up in the hills. The trees stand very close together, and the ground is badly kept, so that there is a dense undergrowth of weeds. Among them are particularly common: *Triumfetta indica, Crotalaria striata, Sida acuta* and *S. rhombifolia, Urena lobata, Elephantopus scaber,* and *Oplismenus compositus,* often also *Imperata cylindrica.* Behind, and sometimes between the coco plantations are the fields of the population, and arable land is also found in and against the hills wherever there is a proper tillable top-part. The greater part of these hills, however, especially there where the soil consists of limestone, is uncultivated, and is covered with a very sparse vegetation of grass and shrubs. Everywhere the white limestone is visible between the plants. Nothing is left of the original vegetation. *Imperata cylindrica* is common, but close grass-fields have developed nowhere. The principal shrubs which grow scattered are: *Lantana Camara, Streblus asper, Sida rhombifolia, Glochidion molle* and *G. nigrum, Pittosporum timorense, Grewia acuminata, Ehretia laevis,* and *Azima sarmentosum,* all of them as small specimens. There are also small specimens of *Ficus retusa.* This poor vegetation covers the ridges and slopes up to a height of about 250 m; from here upwards is rather more arable land, and remnants of the original vegetation are found along moisty, sunken roads, and along brooks and small rivers. At the highest part, about 600 m above sea-level which is a kind of plateau, are small patches of virgin forest, but here too the greater part is covered with grass. Besides there are vast wildernesses of *Psidium Guajava.* In places where the soil is marshy, occur small wildernesses of a large *Pandanus.* In the woods are still other larger trees, which, however, are not in flower, so that I could not collect any materials. *Ficus fistulosa* and *F. retusa, Dysoxylum* species and *D. arborescens, Actinodaphne* species, *Alangium sundanum,* and *Pithecolobium Junghuhnianum* occur, and besides many shrubs, such as: *Diospyros ellipticifolia, Pavetta indica,* a *Coffea* species, *Petunga longifolia, Glochidion zeylanicum, Rubus alcaefolius* and *R. rosaefolius, Grewia laevigata, Evodia* species, *Leea angulata* and *L. aequata, Schefflera elliptica* and *S.* species. Several lianas and climbers such as: *Embelia philippinensis, Thunbergia fragrans, Ipomoea gracilis, Cissus hastata, Mucuna pruriens.* Among the herbs particularly several ferns, such as: *Arthropteris obliterata, Diplazium polypodioides,* and also *Desmodium zonatum, Panicum colonum, Calanthe veratrifolia, Habenaria* species. *Calanthe* occurs locally in dense vegetations. Also in these wood remnants epiphytes are rare; *Asplenium Nidus* only could be found here and there in larger numbers.

The steep south coast, which is about 400 m high, was covered for the greater part with grass and thin shrub vegetations.

In the southern part of the island, which is more thinly populated, are more forests, but here too they are thin and poor in epiphytes. In the muddy bay near the campong Barang-Barang is a vast mangrove forest, which, however, consists of but few species, mainly species of *Bruguiera, Ceriops Candolleana,* and *Rhizophora mucronata.* On rocky patches are found rather more *Rhizophora stylosa, Bruguiera caryophylloides,* and *Pithecolobium umbellatum.*

In many places the limestone rocks rise steeply up from the sea, and these walls bear particularly *Cycas Rumphii, Pandanus tectorius,* and *Euphorbia plumerioides*; *Casuarina equisetifolia* is found in sandy zones; *Piper retrofractum* is also common on these coasts.

Plants found in the island of Salajar.

Pteridophyta.

Lycopodiaceae.

1. Lycopodium cernuum L., 550 m, D.[1]) 1742.

Selaginellaceae.

2. Selaginella plana HIERON., T. 13879; 500 m, D. 1761.

Psilotaceae.

3. Psilotum nudum L., D. 1793.

Schizaeaceae.

4. Lygodium circinatum SW., 300 m, D. 1714; 500 m, D. 1749.

Polypodiaceae.

5. Adiantum caudatum L., 250 m, D. 1678 — 6. A. lunulatum BURM., 200 m, D. 1657 — 7. Anthrophium callifolium BL., D. 1722 — 8. Arthropteris obliterata J. SM., 550 m, D. 1769 — 9. Aspidium polymorphum WALL. et WRIGHT., 300 m, D. 1720 — 10. Asplenium contiguum KAULF., 50 m, D. 1884 — 11. A. Nidus L., 400 m, D. 1699 — 12. Cyclophorus lanceolatus ALSTON, 200 m, D. 1659; 500 m, D. 1783 — 13. Davallia denticulata METT., 200 m, D. 1840 — 14. Dictyopteris irregularis PR., D. 1751 — 15. Diplazium polypodioides BL., 550 m, D. 1770 — 16. D. proliferum THOU., D. 1768 — 17. Drynaria querci-

[1]) T = J. E. TEIJSMANN; Z = H. ZOLLINGER; D = W. M. DOCTERS VAN LEEUWEN.

folia J. SM., T. 13636, 13856; 200 m, D. 1660 — 18. Dryopteris pteroides O. K., 300 m, D. 1719 — 19. D. subpubescens O. K., D. 1785 — 20. D. uliginosa C. CHR., T. 13877 — 21. Hemionitis arifolia MOORE, 300 m, D. 1652 — 22. Microlepia speluncae MOORE, T. 13584 — 23. Nephrolepis biserrata SCHOTT, 200 m, D. 1825 — 24. N. exaltata SCHOTT, T. 13618; 300 m, D. 1731 — 25. Notholaena hirsuta DESV., 300 m, D. 1811 — 26. Polypodium scolopendria BURM., 300 m, D. 1715, 1721 — 27. Pteris quadriaurita RETZ, 300 m, D. 1723 — 28. Stenosemia aurita PR., D. 1747.

G y m n o s p e r m a e.

Cycadaceae.

29. Cycas Rumphii MIQ., D. 1881.

Gnetaceae.

30. Gnetum Gnemon L., D. 1779.

A n g i o s p e r m a e — D i c o t y l e d o n a e.

Casuarinaceae.

31. Casuarina equisetifolia L., T. 13890; D. 1511.

Moraceae.

32. Cudrania javanensis TRÉC., T. 13828 — 33. Fatoua japonica BL., T. 13920; 200 m, D. 1828 — 34. Ficus Ampelos BURM., 300 m, D. 1650 — 35. F. annulata BL., T. 13762 — 36. F. Benjamina L., T. 13864; D. 1886 — 37. F. callicarpa MIQ., T. 13616, 13793, 13926 — 38. F. fistulosa REINW., D. 1772, 1808 — 39. F. glomerata ROXB., 100 m, D. 1669 — 40. F. hispida L. f., D. 1889 — 41. F. infectoria ROXB., T. 13758 — 42. F. retusa L., T. 13581; D. 1757, 1798; 300 m, 1810, 1912 — 43. F. Rumphii BL., T. 13824 — 44. F. superba MIQ., 400 m, D. 1725 — 45. Phyllochlamys taxoides KOORD., 50 m, D. 1908 — 46. Streblus asper LOUR., T. 13812; 50 m, D. 1672, 1735.

Ulmaceae.

47. Trema orientalis (L.) BL., T. 13884, 13908.

Urticaceae.

48. Fleurya ruderalis GAUD., D. 1897 — 49. Laportea species, T. 13791 — 50. Pilea species, D. 1697 — 51. Pipturus incanus WEDD., T. 13901.

Piperaceae.

52. Heckeria umbellata KUNTH. var. subpeltata DC., 550 m, D. 1758 — 53. Peperomia pellucida H. B. K., 150 m, D. 1841 — 54. P. species, 400 m, D. 1797 — 55. Piper betle L., 550 m, D. 1741 — 56. P. caninum BL., 300 m, D. 1734; 400 m, D. 1807; 550 m, D. 1745 — 57. P. miniatum BL., T. 13638 — 58. P. retrofractum VAHL, D. 1913.

Santalaceae.

59. Exocarpus latifolius R. BR., D. 1928.

Olacaceae.

60. Ximenia americana L., T. 13810.

Loranthaceae.

61. Amylotheca stenopetala DANS., T. 13587; 200 m, D. 1822 — 62. Ginalloa Arnottiana KORTH., 300 m, D. 1712 — 63. Scurrula fusca G. DON., T. 13771; 400 m, D. 1709.

Chenopodiaceae.

64. Salicornia brachiata ROXB., T. 13892; D. s. n.

Amaranthaceae.

65. Achyranthes aspera L., 50 m, D. 1872 — 66. Aerva scandens WALL., 50 m, D. 1873 — 67. Allmania nodiflora R. BR., D. 1862 — 68. Cyathula prostrata (L.) BL., D. 1842.

Nyctaginaceae.

69. Boerhaavia diandra BURM., T. 13589 — 70. B. mutabilis R. BR., T. 13899 — 71. Pisonia aculeata L., T. 13625, 13830; D. 1869.

Aizoaceae.

72. Glinus lotoides LOEFL., T. 13613 — 73. Sesuvium portulacastrum L., D. s. n.

Cactaceae.

74. Opuntia species, D. s. n.

Portulacaceae.

75. Portulaca oleracea L., D. s. n.

Euphorbiaceae.

76. Acalypha Caturus BL., T. 13594, 13610, 13875; 550 m, D. 1765 — 77. Alchornea rugosa MUELL.-ARG., 400 m, D. 1850 — 78. Antidesma

ghaesembilla GAERTN., T. 13871 — 79. Breynia species, 100 m, D. 1877 — 80. Bridelia monoica MERR., 200 m, D. 1835; 50 m, D. 1891 — 81. Cladogynos orientalis ZIPP., Z. 1165 — 82. Claoxylon species, D. 1654; 400 m, D. 1694 — 83. Codiaeum variegatum BL., 550 m, D. 1764 — 84. Euphorbia Atoto FÖRST., T. 13925 — 85. E. plumerioides TEYSM., D. 1894 — 86. Excoecaria Agallocha L., 1856, 1931 — 87. Gelonium species, 400 m, D. 1695 — 88. Glochidion molle BL., 250 m, D. 1816 — 89. G. rubrum BL., 200 m, D. 1827 — 90. G. zeylanicum JUSS., T. 13799; 600 m, D. 1726 — 91. Homalanthus populneus O. K., 300 m, D. 1716 — 92. Macaranga hispida MUELL.-ARG., D. 1754, 1755 — 93. Mallotus philippinensis MUELL.-ARG., 200 m, D. 1681; 400 m, D. 1855, 1866, 1870 — 94. M. resinosus MERR., T. 13912 — 95. Phyllanthus species, D. 1680 — 96. Ricinus communis L., D. s. n. — 97. Rottlera tinctoria HASSK., T. 13881 — 98. Strophioblachia fimbricalyx BOERL., D. 1879.

Annonaceae.

99. Artabotrys odoratissimus R. BR., 50 m, D. 1904 — 100. Polyalthia canangioides BOERL., T. 13576 — 101. Unona discolor VAHL, D. 1650 — 102. Uvaria littoralis BL., T. 13611; 250 m, D. 1690.

Aristolochiaceae.

103. Aristolochia Tagala CHAM., 300 m, D. 1817.

Lauraceae.

104. Actinodaphne species, 500 m, D. 1773 — 105. Cassytha filiformis L., D. s. n. — 106. Litsea Forstenii BL., T. 13588 — 107. L. ochracea BL., T. 13604.

Hernandiaceae.

108. Hernandia peltata MEISSN., T. 13850.

Menispermaceae.

109. Stephania Forsteri A. GRAY, 400 m, D. 1792.

Capparidaceae.

110. Capparis sepiaria L., T. 13836.

Moringaceae.

111. Moringa oleifera LAMK., D. 1868.

Flacourtiaceae.

112. Casearia grewiaefolia VENT., T. 13815.

Begoniaceae.

113. Begonia species, 550 m, D. 1746.

Dilleniaceae.

114. Tetracera scandens MERR., 550 m, D. 1750.

Guttiferae.

115. Calophyllum Inophyllum L., 400 m, D. 1848.
116. Garcinia dulcis KURZ, T. 13579.

Pittosporaceae.

117. Pittosporum timorense BL., D. 1914.

Rosaceae.

118. Rubus alcaefolius POIR., 500 m, D. 1732 — 119. R. rosaefolius SM., 600 m, D. 1737.

Mimosaceae.

120. Acacia species, 100 m, D. 1661 — 121. Pithecolobium Junghuhnianum BENTH., 400 m, D. 1805 — 122. P. umbellatum BENTH., T. 13759; D. 1933.

Papilionaceae-Caesalpinioideae.

123. Bauhinia binata BLANCO, D. 1932 — 124. B. Lingua DC., T. 13639, 18031 — 125. Caesalpinia Crista L., 300 m, D 1812 — 126. Cassia alata L., 400 m, D. 1852 — 127. C. Fistula L., T. 13860 — 128. C. marginata ROXB., T. 13757 — 129. C. megalantha DCNE, T. 13829 — 130. C. Sophora L., T. 13763; 200 m, D. 1662; D. 1826 — 131. C. Tora L., 350 m, D. 1708 — 132. Cynometra ramiflora L., T. 13840 — 133. Mezoneurum pubescens DESF., T. 13873 — 134. Peltophorum pterocarpum BACK., T. 13769, 13848.

Papilionaceae-Papilionatae.

135. Abrus precatorius L., 250 m, D. 1686 — 136. Cajanus Cajan DRUCE, 400 m, D. 1789 — 137. Canavalia maritima THOU., D. s. n. — 138. Cantharospermum volubile MERR., D. 1936 — 139. Clitoria Ternatea L., D. s. n. — 140. Crotalaria ferruginea GRAH., 400 m, D. 1800; D. 1849 — 141. C. striata DC., D. 1305, 1946 — 142. Derris elegans BENTH., T. 13838 — 143. D. elliptica BENTH., T. 13641 — 144. D. multiflora BENTH., T. 13603 — 145. D. scandens BENTH., D. 1790, 1892 — 146. Desmodium laxiflorum DC., 300 m, D. 1655 — 147. D. umbellatum DC., D. 1940 — 148. D. zonatum MIQ., 400 m, D. 1794 — 149. Dioclea

javanica BENTH., 500 m, D. 1775 — 150. Dolichos falcatus KLEIN, 400 m, D. 1802 — 151. Dunbaria circinalis BAKER, 300 m, D. 1692 — 152. Flemingia strobilifera R. BR., 200 m, D. 1824 — 153. Inocarpus edulis FORST., T. 13623, 13874 — 154. Mucuna pruriens DC., 500 m, D. 1776 — 155. Phylaceum bracteosum BENN., D. 1756 — 156. Pongamia pinnata MERR., T. 13909; D. 1942, 1947 — 157. Pseudarthria viscida W. et A., D. 1871 — 158. Psophocarpus tetragonolobus DC., D. 1788 — 159. Rhynchosia acuminatissima MIQ., 400 m, D. 1795 — 160. Sesbania grandiflora PERS., D. 1926 — 161. Tephrosia purpurea PERS., 200 m, D. 1664 — 162. Teramnus labialis SPRENG., D. 1691 — 163. Uraria lagopodioides DESV., 350 m, D. 1818 — 164. U. species, D. 1915.

Elaeagnaceae.

165. Elaeagnus species, T. 13648.

Lythraceae.

166. Pemphis acidula FORST., T. 13891, 13923; D. 1939.

Sonneratiaceae.

167. Sonneratia alba SM., D. s. n.

Rhizophoraceae.

168. Bruguiera caryophylloides BL., D. 1923 — 169. B. gymnorrhiza LAMK., T. 13817 — 170. Ceriops Candolleana ARN., T. 13921; D. 1927 — 171. Rhizophora mucronata LAMK., T. 13816 — 172. R. stylosa GRIFF., T. 13814.

Combretaceae.

173. Lumnitzera racemosa WILLD., D. 1935 — 174. Terminalia Catappa L., D. s. n. — 175. T. edulis BLANCO, T. 13839.

Myrtaceae.

176. Eugenia Cumini MERR., T. 13619 — 177. E. malaccensis LAMK., D. 1305 — 178. E. polycephala MIQ., T. 13760 — 179. E. Reinwardtiana DC., D. 1920 — 180. E. species, D. 1907 — 181. E. species, 300 m, D. 1676 — 182. Psidium Guajava L., D. s. n.

Melastomataceae.

183. Melastoma Malabathricum L., 550 m, D. 1730 — 184. Memecylon species, T. 13600.

Oenotheraceae.

185. Ludwigia parviflora ROXB., 200 m, D. 1819.

Malvaceae.

186. Abutilon indicum Sw., 100 m, D. 1876 — 187. Gossypium obtusifolium ROXB., D. s. n. — 188. Hibiscus tiliaceus L., T. 13761; 200 m, D. 1836; 500 m, D. 1752 — 189. Sida acuta BURM., D. 1838 — 190. S. rhombifolia L., 300 m, D. 1693 — 191. Thespesia Lampas DALZ. et GIBS., 200 m, D. 1821 — 192. Urena lobata L., 550 m, D. 1763.

Tiliaceae.

193. Grewia acuminata JUSS., D. 1916 — 194. G. laevigata VAHL, T. 13646; D. 1823; 50 m, D. 1882; 500 m, D. 1784 — 195. G. multiflora JUSS., T. 18037 — 196. Triumfetta indica LAMK., D. 1305, 1845, 1885.

Sterculiaceae.

197. Kleinhovia hospita L., 50 m, D. 1874 — 198. Pterospermum acerifolium WILLD., 250 m, D. 1683 — 199. Sterculia species, D. 1918.

Elaeocarpaceae.

200. Elaeocarpus floribundus BL., D. 1753.

Oxalidaceae.

201. Biophytum sensitivum DC., D. 1943.

Malpighiaceae.

202. Hiptage benghalensis KURZ, T. 13821.

Rutaceae.

203. Evodia species, 600 m, D. 1740 — 204. Glycosmis cochinchinensis PIERRE, T. 13595 — 205. Micromelum pubescens BL., T. 13826.

Simarubaceae.

206. Brucea amarissima MERR., T. 13898, 13907.

Burseraceae.

207. Canarium commune L., D. s. n.

Meliaceae.

208. Aglaia argentea BL., T. 13854; 100 m, D. 1667 — 209. Dysoxylum amooroides MIQ., T. 13859 — 210. D. arborescens MIQ., 500 m, D. 1759, 1787 — 211. D. species, 500 m, D. 1703.

Anacardiaceae.

212. Buchanania arborescens BL., T. 13858; 250 m, D. 1679 — 213. Mangifera indica L., D. s. n. — 214. Semecarpus gigantifolius VIDAL, T. 13583; D. 1942.

Sapindaceae.

215. Allophyllus Cobbe BL., D. 1899 — 216. Arytera littoralis BL., D. 1921 — 217. Cardiospermum Halicacabum L., 200 m, D. 1663 — 218. Dodonaea viscosa JACQ., T. 13852; D. 1944 — 219. Schleichera trijuga WILLD., T. 13626, 13764.

Celastraceae.

220. Evonymus javanicus BL., D. 1739.

Rhamnaceae.

221. Colubrina asiatica BROGN., T. 13615 — 222. Gouania javanica MIQ., 100 m, D. 1887 — 223. Zizyphus celtidifolia BL., 100 m, D. 1875 — 224. Z. Oenoplia MILL., 200 m, D. 1837.

Vitaceae.

225. Ampelocissus aculeata PLANCH., T. 13924 — 226. A. arachnoidea PLANCH., T. 13858 — 227. Cissus adnata ROXB., T. 13634; 550 m, D. 1760 — 228. C. discolor VENT., 300 m, D. 1656 — 229. C. hastata PLANCH., 500 m, D. 1778 — 230. C. nodosa BL., 200 m, D. 1665 — 231. C. repanda VAHL., 400 m, D. 1853 — 232. Leea aequata L., 400 m, D. 1846 — 233. L. angulata KORTH., 550 m, D. 1767 — 234. L. rubra BL., T. 13865 — 235. Vitis flexuosa THUNB., T. 13857.

Cornaceae.

236. Alangium sundanum MIQ., 600 m, D. 1726.

Araliaceae.

237. Schefflera elliptica HARMS., 400 m, D. 1700 — 238. S. species, 600 m, D. 1728.

Plumbaginaceae.

239. Plumbago zeylanica L., 50 m, D. 1890.

Myrsinaceae.

240. Aegiceras floridum R. et SCH., T. 13813 — 241. Embelia philippinensis DC., 500 m, D. 1734 — 242. Maesa indica WALL., 150 m, D. 1844.

Ebenaceae.

243. Diospyros ellipticifolia BAKH., T. 13645, 13686; Z. 3325; 400 m, D. 1796 — 244. D. malabarica KOSTEL., T. 13900 — 245. D. maritima BL., T. 13910 — 246. D. montana ROXB., T. 13914.

Convolvulaceae.

247. Ipomoea gracilis R. BR., 550 m, D. 1736 — 248. Erycibe paniculata ROXB., T. 13596 — 249. Ipomoea Pes-caprae SWEET, D. 1865 — 250. Merremia hastata HALL. f., T. 13888; D. 1910 — 251. M. vitifolia HALL. f., 300 m, D. 1702 — 252. Stictocardia species, Z. 3327.

Borraginaceae.

253. Cordia Myxa L., D. 1919 — 254. Ehretia laevis ROXB., D. 1917 — 255. Tournefortia argentea L. f., D. 1906.

Solanaceae.

256. Datura fastuosa L., T. 18033; 20 m, D. 1673.

Scrophulariaceae.

257. Ilysanthes species, 400 m, D. 1801.

Bignoniaceae.

258. Dolichandrone spathacea SCHUM., T. 13861; D. 1305.

Acanthaceae.

259. Asystasia intrusa BL., 50 m, D. 1900; 250 m, D. 1682; 400 m, D. 1847 — 260. Barleria Prionitis L., D. 1911 — 261. Hypoestes species, 250 m, D. 1687 — 262. Josephinia imperatricis VENT., T. 18034 — 263. Justicia Gendarussa BURM.f., T. 13855 — 264. Lepidagathis javanica BL., T. 13643; D. 1902 — 265. Pseuderanthemum diversifolium MIQ., T. 13590; 250 m, D. 1680 — 266. Ruellia repens L., D. 1650, 1698 — 267. Thunbergia fragrans ROXB., 500 m, D. 1738.

Verbenaceae.

268. Avicennia officinalis L., D. 1934 — 269. Clerodendron inerme GAERTN., D. 1305, 1947 — 270. Gmelina asiatica L. var. villosa BAKH., T. 13845; 550 m, D. 1750 — 271. Lantana Camara L., D. 1674 — 272. Vitex parviflora JUSS., T. 13813 — 273. V. trifolia L., D. 1710, 1863.

Labiatae.

274. Coleus atropurpureus BENTH., 50 m, D. 1888 — 275. Cymaria acuminata DECNE., 50 m, D. 1883 — 276. Hyptis capitata JACQ., 550 m, D. 1762 — 277. H. suaveolens POIT., T. 13796.

Loganiaceae.

278. Strychnos septemnervis CLARKE, 550 m, D. 1743.

Apocynaceae.

279. Aganosma marginata G. DON., T. 13872 — 280. Anodendron tenuiflorum MIQ., T. 13614 — 281. Cerbera Manghas L., D. 1303 — 282. Kopsia flavida BL., 400 m, D. 1696 — 283. Ochrosia species, D. 1896 — 284. Rauwolfia amsoniifolia DC., T. 13833, 13863, 13882, 13913; Z. 3322; D. 1867 — 285. Tabernaemontana floribunda BL., 200 m, D. 1831 — 286. Wrightia calycina DC., T. 13602; 300 m, D. 1813.

Asclepiadaceae.

287. Asclepias curassavica L., 200 m, D. 1666 — 288. Ceropegia curviflora HASSK., 50 m, D. 1671 — 289. Cynanchum carnosum SCHLTR., D. 1929 — 290. C. species, 250 m, D. 1689; 550 m, D. 1768 — 291. Dischidia Rafflesiana WALL., D. 1895 — 292. Gymnanthera paludosa BL., D. 1930 — 293. Secamone species, D. 1938 — 294. Tylophora exilis COLEBR., 300 m, D. 1713.

Rubiaceae.

295. Azima sarmentosa B. et H., T. 13905; D. 1925 — 296. Coffea species, 500 m, D. 1777 — 297. Guettarda speciosa BL., T. 18035 — 298. Morinda tinctoria ROXB., T. 13880 — 299. Oldenlandia corymbosa L., 200 m, D. 1830 — 300. O. paniculata L., D. 1992 — 301. Pavetta indica L., 400 m, D. 1705 — 302. Petunga longifolia DC., 500 m, D. 1766 — 303. Psychotria species, 300 m, D. 1706 — 304. Tarenna saleirensis VALETON, T. 13640.

Cucurbitaceae.

305. Benincasa hispida COGN., 200 m, D. 1820, 1893 — 306. Lagenaria leucantha RUSBY., D. s. n. — 307. Melothria perpusilla COGN., 400 m, D. 1698.

Compositae.

308. Blumea balsamifera DC., 250 m, D. 1815 — 309. B. chinensis DC., 350 m, D. 1707 — 310. Crepis japonica BENTH., 400 m, D. 1803 — 311. Elephantopus scaber L., 250 m, D. 1701 — 312. Gynura sarmentosa DC., T. 13609 — 313. Mikania cordata B. L. ROBINSON, 400 m, D. 1711 — 314. Pterocaulon sphacelatum BENTH. et HOOK.F., T. 13887 — 315. Senecio sonchifolius MOENCH., 300 m, D. 1814 — 316. Vernonia actaea KOST., D. 1937 — 317. V. erigeroides DC., T. 13878, 13880; 200 m, D. 1834 — 318. Wedelia biflora DC., T. 13599, 13922; D. s. n. — 319. W. species, 400 m, D. 1799.

Angiospermae-Monocotyledonae.

Hydrocharitaceae.

320. Enhalus acoroides STEUD., T. 18027.

Potamogetonaceae.

321. Cymodocea ciliata EHRENB., T. 13917.

Liliaceae.

322. Smilax zeylanica L., 200 m, D. 1650; D. 1839.

Pontederiaceae.

323. Monochoria vaginalis PRESL, 400 m, D. 1804.

Dioscoreaceae.

324. Dioscorea alata L., Z. 1171 — 325. D. oppositifolia L., 250 m, D. 1688 — 326. D. triphylla L., T. 13866.

Cyperaceae.

327. Cyperus distans L. f., T. 13820, 13876 — 328. C. pennatus LAMK., T. 13919; D. 1858 — 329. C. stoloniferus RETZ, D. 1945 — 330. Fimbristylis annua R. et SCH., T. 13822; 300 m, D. 1718 — 331. F. spathacea ROTH., D. 1861 — 332. Kyllinga monocephala ROTTB., D. 1857 — 333. Scleria multifoliata BOECK., 400 m, D. 1854.

Gramineae.

334. Apluda mutica L., 150 m, D. 1843 — 335. Asthenochloa tenera BUSE, 100 m, D. 1880 — 336. Centotheca latifolia TRIN., 50 m, D. 1670 — 337. Imperata cylindrica P. B., D. s. n. — 338. Monerma repens P. B., Z. 1083 — 339. Oplismenus compositus P. B., 200 m, D. 1658 — 340. Panicum colonum L., 500 m, D. 1782 — 341. Pogonatherum paniceum HACK., T. 13819 — 342. Spinifex littoreus MERR., D. 1864 — 343. Sporolobus diander P. B., 200 m, D. 1684.

Cannaceae.

344. Canna indica L., 50 m, D. 1878.

Orchidaceae.

345. Calanthe veratrifolia R. BR., 550 m, D. 1771 — 346. Cymbidium Finlaysonianum LINDL., 250 m, D. 1685 — 347. Dendrobium crumenatum SW., T. 13818 — 348. Habenaria species, 500 m, D. 1677 — 349. Liparis species, D. 1369 — 350. Microstylis latifolia J. J. S., 300 m, D. 1717 — 351. Tropidia species, D. 1372.

Palmae.

352. Areca Catechu L., D. s. n. — 353. Arenga pinnata MERR., D. s. n. — 354. Borassus flabellifer L., T. s. n. — 355. Cocos nucifera L., D. s. n. — 356. Corypha Utan LAMK., T. s. n. — 357. Nipa fruticans WURMB, D. s. n.

Araceae.

358. Pothos Korthalsi SCHOTT., 300 m, D. 1651.

Pandanaceae.

359. Pandanus tectorius SOL., D. s. n. — 360. Pandanus species, 600 m, D. s. n.

6. THE ISLAND OF KAJOEADI.

This is a small, oblong island; the direction of the longitudinal axis is NW to SE. It consists of raised coral rocks, only along the coast occur a few level patches, the rest is hilly; the tops are, from north to south: Bonélambère, Boehangpararang, and Tandjoenglipang, which are from 150 to 200 m high. There are only narrow strips of sandy beach, otherwise the coast is formed by raised coral reefs, fanciful and full of grottos. There are a few small campongs, the inhabitants of which live by fishing. Round the campongs are small fields where cocos, maize and *Musa* are cultivated. For the rest the island is covered with a thin-stemmed wood, and with shrubs. The soil consists for the greater part of limestone rocks, which are eroded in a very fantastic manner, so that points and blocks of the coral rocks stick out everywhere above the thin layer of humus. Where this layer is not too thin the wood is cleared and maize and *Cucurbitaceae* are cultivated. The plants stand in hollows between the coral rocks, often very far apart.

The remaining wood consisted for the greater part of young, non-flowering trees; epiphytes were not present, and lianas were very sparse. Mangrove was also absent. On the coral rocks near the sea I found a species of *Vernonia* with fleshy leaves and beautiful, purple capitula, *V. actaea*; the *Pescaprae* and *Barringtonia* associations were very poorly developed.

Plants found in the island of Kajoeadi.

Dicotyledonae.

1. Fatoua japonica BL., D. 1812 — 2. Ficus retusa L., D. 1306 — 3. Fleurya ruderalis GAUD., 200 m, D. 1327 — 4. Deeringia amarantoides MERR., 150 m, D. 1329 — 5. Macaranga Tanarius MUELL.-ARG., D. 1333,

1340 — 6. Mallotus moluccanus MUELL.-ARG., 150 m, D. 1328 — 7. Aristolochia Rumphii KOSTEL., 100 m, D. 1336 — 8. Anamirta Cocculus W. et A., 300 m, D. 1324 — 9. Acacia species, D. 1325 — 10. Abrus precatorius L., D. 1345 — 11. Pongamia pinnata MERR., D. 1314 — 12. Glycosmis cochinchinensis PIERRE, D. 1341 — 13. Triumfetta indica LAMK., D. 1307 — 14. Kleinhovia hospita L., D. 1346 — 15. Pterospermum acerifolium WILLD., D. 1326 — 16. Brucea amarissima MERR., D. 1332 — 17. Munronia javanica BENN., 200 m, D. 1339 — 18. Gymnosporia montana LAWS., D. 1316 — 19. Tetrastigma lanceolarium PLANCH., D. 1344 — 20. Calonyction species, D. 1308 — 21. Ipomoea Pes-caprae SWEET, D. 1310 — 22. Jacquemontia paniculata HALL. f., 100 m, D. 1330 — 23. Josephinia imperatricis VENT., D. 1313 — 24. Asystasia intrusa BL., D. 1321 — 25. Clerodendron inerme GAERTN., D. 1311 — 26. Vitex parviflora JUSS., D. 1309 — 27. Leucas javanica BENTH., D. 1318 — 28. Tabernaemontana floribunda BL., D. 1342 — 29. Ceropegia curviflora HASSK., D. 1337 — 30. Cucumis Melo L., D. 1331 — 31. Cucurbita Pepo L., 200 m, D. 1323 — 32. Melothria perpusilla COGN., D. 1334 — 33. Scaevola frutescens KRAUSE, D. 1317 — 34. Senecio species, D. 1319 — 35. Vernonia actaea KOST., D. 1320 — 36. Wedelia biflora DC., D. 1315.

Monocotyledonae.

37. Dioscorea oppositifolia L., 50 m, D. 1338 — 38. Spinifex littoreus MERR., D. s. n. — 39. Cocos nucifera L., D. s. n. — 40. Pandanus tectorius SOL., D. s. n.

7. THE ISLAND OF KALAOTOA.

This island is the most south easterly of the Salajar Archipelago. It is larger than Kajoeadi, but it displays the same particulars. The coast is formed for the greater part by raised coral formations with many caves; sandy beaches occur only here and there, the *Pescaprae* and *Barringtonia* associations are, consequently, scarcely developed. Mangrove is entirely absent. The interior of the island is hilly, and in the south-east it reaches a height of 320 m; a ridge, the tops of which reach up to 250 and 300 m, runs in the direction north to south. The soil consists of black earth with in between pointed coral rocks. In the south-west is a small fishermen's campong, surrounded by disorderly arable land, and behind this, deserted and weed-grown fields with young trees and low shrubs growing in them. The rest is covered with thin wood, only a few specimens of larger trees rising above them. One single epiphyte,

Polypodium punctatum, occurs in the higher parts, and there were also found two fructifying terrestrial orchids, *Liparis* and *Tropidia* species. A large liana, *Mucuna gigantea,* was remarkably common; the inflorescences consisted of a thin peduncle, about 1 m long, with at the end an accumulation of greenish white flowers. Many trees were cut down, but it appeared that they were not flowering, so that nothing can be recorded about the composition of the wood.

Plants found in the island of Kalaotoa.

Pteridophyta.

1. Dryopteris pteroides O. K., 300 m, D. 1378 — 2. Polypodium punctatum Sw., 150 m, D. 1374.

Dicotyledonae.

3. Ficus Ampelos BURM., D. 1376 — 4. Phyllochlamys taxoides KOORD., 200 m, D. 1381 — 5. Trema orientale (L.) BL., D. 1401 — 6. Pipturus incanus WEDD., D. 1400; 50 m, D. 1409 — 7. Deeringia amarantoides MERR., D. 1402 — 8. Acalypha Caturus BL., 250 m, D. 1370 — 9. Bridelia monoica MERR., D. 1399 — 10. Cyclostemon species, 300 m, D. 1365 — 11. Macaranga Tanarius MUELL.-ARG., D. 1347 — 12. Mallotus philippinensis MUELL.-ARG., 50 m, D. 1407 — 13. Pycnarrhena celebica DIELS, 300 m, D. 1368 — 14. Albizzia saponaria BL., D. 1357 — 15. Cassia timorensis DC., D. 1398 — 16. Desmodium laxiflorum DC., 300 m, D. 1380 — 17. Mucuna gigantea DC., 300 m, D. 1371 — 18. Phyllacium bracteosum BENN., D. 1382 — 19. Quisqualis sulcata v. SL., D. 1405 — 20. Abelmoschus moschatus MEDIC., 50 m, D. 1385 — 21. Abutilon indicum Sw., 100 m, D. 1386 — 22. Gossypium obtusifolium ROXB., D. 1360 — 23. Hibiscus hirtus L., D. 1352 — 24. Urena lobata L., 150 m, D. 1383 — 25. Dracontomelum mangiferum BL., D. 1367 — 26. Allophylus Cobbe BL., D. 1356 — 27. Erioglossum edule BL., D. 1348 — 28. Corchorus acutangulus LAMK., D. 1361 — 29. Grewia laevigata VAHL, D. 1358 — 30. Cardiopteryx lobata WALL., D. 1395 — 31. Gouania javanica MIQ., 20 m, D. 1397 — 32. Leea indica MERR., 100 m, D. 1408 — 33. Tetrastigma lanceolarium PLANCH., D. 1411 — 34. Ellipanthus species, 300 m, D. 1364 — 35. Maesa indica WALL., D. 1359, 1404 — 36. Cordia Myxa L., D. 1406 — 37. Tournefortia argentea L. f., D. 1387 — 38. T. sarmentosa LINK., 200 m, D. 1384 — 39. Asystasia intrusa BL., D. 1351 — 40. Hypoestes species, D. 1388 — 41. Lepidagathis species, 200 m, D. 1377 — 42. Ruellia repens L., D. 1363 — 43. Callicarpa longifolia LAMK., D. 1349 — 44. Clerodendron

Blumeanum SCHAUER, D. 1375 — 45. C. kalaotoense H. J. LAM, D. 1373 — 46. Premna integrifolia L., D. 1540 — 47. Vitex parviflora JUSS., D. 1355 — 48. Anisomeles indica O. K., D. 1392 — 49. Ceropegia curviflora HASSK., D. 1389 — 50. Cynanchum species, D. 1354; 10 m, D. 1393 — 51. Blumea balsamifera DC., 100 m, D. 1379 — 52. Vernonia patula MERR., D. 1362 — 53. Wedelia biflora DC., D. 1390.

Monocotyledonae.

54. Smilax zeylanica L., D. 1410 — 55. Dioscorea oppositifolia L., D. 1394, 1396, 1403 — 56. Oplismenus compositus P. B., D. 1366 — 57. Setaria verticillata P. B., D. 1391 — 58. Liparis species, 250 m, D. 1363 — 59. Tropidia species, 300 m, D. 1372.

8. THE ISLAND OF BONERATE.

This island is populated somewhat denser than the other smaller islands of this archipelago, and consequently little is left of the original vegetation. The coast is for the greater part a steep coral coast, so that vegetations of beach plants have developed but sparsely. The country is hilly, and shelves away to the sea; the highest top is about 100 m above sea-level. Near the campongs is arable land, partly cultivated, partly deserted, and then covered with thin brushwood and grasses. Little is left of the forest, the trees are slender-stemmed, large trees are pretty well absent. Up to the highest points small woods alternate with monotonous vegetations of *Andropogon contortus,* with only here and there such shrubs as *Bridelia monoica, Glochidion rubrum, Capparis horrida,* and *Grewia laevigata.* BAKKER (1862, p. 215) mentions the presence of plains covered with thin grass and shrubs, and the absence of large trees, so that this island seems to have been disforested for quite a long time already. *Vernonia actaea, Vitex parviflora, Colubrina asiatica,* and *Pemphis acidula* grow scattered on the limestone rocks near the sea.

Plants collected in the island of Bonerate.

Dicotyledonae.

1. Piper retrofractum VAHL, D. 1463 — 2. Achyranthes aspera L., D. 1430 — 3. Pupalia lappacea MIQ., 100 m, D. 1466 — 4. Anamirta Cocculus W. et A., D. 1439 — 5. Bridelia minutiflora HOOK.f., D. 1412 — 6. B. monoica MERR., D. 1414 — 7. Cladogynos orientalis ZIPP., D. 1449 — 8. Euphorbia serrulata REINW., D. 1417, 1441 — 9. Glochidion rubrum BL., D. 1413 — 10. Macaranga Tanarius MUELL.-ARG., D. 1436 — 11. Cassytha filiformis L., D. 1440 — 12. Capparis horrida L., D. 1457 —

13. Adenia species, D. 1431 — 14. Albizzia saponaria BL., 50 m, D. 1447 — 15. Canavalia ensiformis DC., D. 1443 — 16. C. maritima THOU., D. 1464 — 17. Cantharospermum scarabaeoides BAILL., D. 1450 — 18. Clitorea Ternatea L., D. 1434 — 19. Mucuna gigantea DC., 50 m, D. 1451 — 20. M. pruriens DC., D. 1458 — 21. Vigna marina MERR., D. 1425 — 22. Pemphis acidula FORST., D. 1422 — 23. Abutilon crispum Sw., D. 1460 — 24. Hibiscus vitifolius L., D. 1461 — 25. Leea rubra BL., D. 1462 — 26. Grewia laevigata VAHL., D. 1470 — 27. Triumfetta indica LAMK., s. n. — 28. Helicteres Isora L., D. 1427 — 29. Pterospermum acerifolium WILLD., D. 1448 — 30. Ryssopteris tiliifolia JUSS., D. 1432 — 31. Colubrina asiatica BROGN., D. 1456 — 32. Gymnosporia montana LAWS., D. 1419 — 33. Diospyros maritima BL., D. 1416 — 34. Ipomoea Nil ROTH., D. 1452 — 35. Jacquemontia paniculata HALL.f., 40 m, D. 1435 — 36. Merremia hastata HALL.f., 50 m, D. 1445 — 37. Ipomoea Quamoclit L., D. 1438 — 38. Asystasia intrusa BL., D. 1420 — 39. Premna integrifolia L., D. 1418 — 40. Vitex parviflora JUSS., D. 1426 — 41. Coleus atropurpureus BENTH., D. 1444 — 42. Ixora timorensis DECNE., D. 1459 — 43. Adenostemma Lavenia O. K., D. 1435 — 44. Vernonia actaea KOST., D. 1423 — 45. V. erigeroides DC., D. 1424 — 46. Wedelia biflora DC., D. 1421.

Monocotyledonae.

47. Smilax zeylanica L., D. s. n. — 48. Dioscorea bulbifera L., 50 m, D. 1453 — 49. Andropogon contortus L., 20 m, D. 1429 — 50. Apluda mutica L., D. 1433 — 51. Imperata cylindrica P. B., D. s. n. — 52. Cocos nucifera L., D. s. n.

9. THE PASITALOE ISLANDS.

These are three small coral islands, the largest being 1 kilometer long and three quarters of a kilometer broad, but slightly raised above the sea-level; the egg-hills only of the orange-legged Megapode, ***Megapodius duperreyi*** (LESS & GARN), form slight elevations of the soil. My hopes that these islands would be uninhabited were not realized; in one of the islands was a small campong, the central parts of the three islands were cultivated and many coco-nuts had been planted. High trees, such as occur in the coral islands north of Batavia, were lacking. The sandy beaches were covered with a few representatives of the ***Pescaprae*** association: ***Euphorbia Atoto, Canavalia maritima, Tribulus cistoides, Ipomoea Pes-caprae, Wedelia biflora,*** and ***Spinifex littoreus.*** The last plant particularly covered vast areas with close vegetations. ***Sesuvium***

portulacastrum also grew on the sandy beach. *Casuarina equisetifolia* was numerous, but only as small specimens. *Guettarda speciosa* was the only common representative of the *Barringtonia* association, there were a great many specimens, particularly as shrubs. *Pemphis acidula* formed groves on this soil, which owing to blocks of coral stone was rich in limestone. *Pandanus tectorius* was found as large specimens.

Plants collected in the Pasitaloe Islands.

Dicotyledonae.

1. Casuarina equisetifolia L., D. 1475 — 2. Deeringia amarantoides MERR., D. 1481 — 3. Boerhaavia diffusa L., D. 1480 — 4. B. chinensis DR., D. 1484 — 5. Sesuvium portulacastrum L., D. 1477 — 6. Portulaca oleracea L., D. 1474 — 7. Euphorbia Atoto L., D. 1465 — 8. Canavalia maritima THOU., D. s. n. — 9. Polanisia viscosa DC., D. 1472, 1482 — 10. Pittosporum timorense BL., D. 1471, 1485 — 11. Pemphis acidula FORST., D. 1479 — 12. Tribulus cistoides L., D. 1467 — 13. Ipomoea Pes-caprae SWEET, D. s. n. — 14. Diclyptera species, D. 1478 — 15. Guettarda speciosa L., D. 1473 — 16. Muellerargia timorensis COGN., D. 1468 — 17. Melothria perpusilla COGN., D. 1469 — 18. Vernonia actaea KOST., D. 1466 — 19. Wedelia biflora BL., D. s. n.

Monocotyledonae.

20. Spinifex littoreus MERR., D. s. n. — 21. Cocos nucifera L., D. s. n. — 22. Pandanus tectorius SOL., D. s. n.

10. THE ISLAND OF KALAO.

When seen from the sea the island seems to be entirely covered with virgin forests. There are a few unimportant settlements, surrounded by small fields. The coast is, for the greater part, rocky, only here and there small, white beaches are visible. Mangrove has developed but slightly; it is found here and there along the mouths of small rivers. In the north-west a rather vast area is covered with teak-forest, which owing to the light colour of the inflorescences stands out clearly against the virgin forest. I had an opportunity to make an excursion to this teak-forest and one along the south coast of this island. The teak-forest was a pretty well pure wood, it was mixed with but few other species of trees; the ground was densely covered with various species of shrubs, such as are regularly met with in the teak-forests in Java: species of *Glochidion, Grewia laevigata,* and other species which were not flowering. Along the south coast the wood reached down to the sea; on the steep

rocky coasts were many specimens of *Cycas Rumphii*, and on the sandy patches various beach plants. Epiphytes were rare in the part I visited. I do not possess any data about the composition of the wood.

Plants found in the island of Kalao.

Pteridophyta.

1. Selaginella plana HIERON., 50 m, D. 1490 — 2. Acrostichum aureum L., D. 1511 — 3. Adiantum lunulatum BURM., D. 1489 — 4. Asplenium adiantoides C. CHR., D. 1524 — 5. Cyclophorus lanceolatus ALSTON, D. 1542 — 6. Diacalpe aspidioides BL., 100 m, D. 1499 — 7. Dryopteris extensa O. K., 100 m, D. 1498 — 8. Polypodium punctatum Sw., D. 1534.

Gymnospermae.

9. Cycas Rumphii MIQ., D. 1531.

Ang.-Dicotyledonae.

10. Casuarina equisetifolia L., D. 1511, 1516, 1536 — 11. Pipturus incanus WEDD., 150 m, D. 1500 — 12. Piper bantamense BL., 50 m, D. 1487 — 13. Boerhaavia diffusa L., D. 1527 — 14. Acalypha Caturus BL., 150 m, D. 1493 — 15. Glochidion molle BL., D. 1518 — 16. G. rubrum BL., D. 1522 — 17. Macaranga Tanarius MUELL.-ARG., D. 1505 — 18. Mallotus molluccanus MUELL.-ARG., D. 1506 — 19. Pycnarrhena celebica DIELS, 50 m, D. 1488 — 20. Litsea resinosa BL., D. 1509 — 21. Caesalpinia Crista L., D. 1543 — 22. Desmodium laxiflorum DC., D. 1521 — 23. D. umbellatum DC., D. 1517 — 24. Sophora tomentosa L., D. 1512, 1539 — 25. Vigna marina MERR., D. 1519 — 26. Bruguiera caryophylloides BL., D. 1514 — 27. Grewia laevigata VAHL, 150 m, D. 1503 — 28. Triumfetta indica LAMK., D. 1535 — 29. Hibiscus tiliaceus L., D. 1530 — 30. Sida acuta BURM., D. 1525 — 31. Thespesia populnea SOL., D. 1538 — 32. Ryssopteris tiliaefolia JUSS., 100 m, D. 1493 — 33. Glycosmis cochinchinensis PIERRE, D. s. n. — 34. Arytera littoralis BL., D. 1532 — 35. Tetrastigma lanceolarium PLANCH., D. 1544 — 36. Ellipanthus species, D. 1528 — 37. Stictocardia species, D. 1526 — 38. Merremia hastata HALL.f., D. 1533 — 39. Cordia Myxa L., D. 1541 — 40. Tournefortia argentea L.f., D. 1523 — 41. T. sarmentosa LINK., D. 1502 — 42. Asystasia intrusa BL., D. 1520 — 43. Hemigraphis reptans F. ANDERS., D. 1437 — 44. Pseuderanthemum diversifolium MIQ., 50 m, D. 1432 — 45. Premna integrifolia L., D. 1540 — 46. Tectona grandis L.f., D. s. n. — 47. Vitex Negundo L., D. 1513 — 48. Hyptis capitata

JACQ., D. 1544 — 49. Alstonia scholaris R. BR., D. 1510 — 50. Personsia Cumingiana DC., D. 1515 — 51. Adenostemna Lavenia O. K., 50 m, D. 1491 — 52. Wedelia biflora DC., D. 1532.

Monocotyledonae.

53. Crinum asiaticum L., D. 1545 — 54. Centotheca latifolia TRIN., 100 m, D. 1501 — 55. Thuarea involuta R. BR., D. 1537 — 56. Scleria multiflora BOECK., D. 100 m, D. 1504 — 57. Peristylus goodyeroides LINDL., 100 m, D. 1495 — 58. Orchidacea, 100 m, D. 1496.

11. THE ISLAND OF DJAMPEA.

This is the second largest island of the group, and the soil consists of older rocks (see paragraph 3). In this island one would expect a different and a richer flora than in the other islands which consist for the greater part of younger rock formations. Therefore I made several and longer excursions in this island, but the results did not come up to the expectations. Here too epiphytes are rare, and so were lianas. On the coasts are several campongs, the surroundings consisting of small fields and vast grass wildernesses, mainly covered with *Imperata cylindrica.* The hills in the interior, however, are covered with old virgin forest, which has a remarkable habitus; it consists of large trees with little undergrowth, so that the wood could easily be penetrated into, but the results of the botanical investigation were extremely poor, because the large trees could not be felled. At an altitude of about 300 m the surroundings began to be somewhat moistier; a small species of *Begonia* was common here and there, but here too epiphytes were so to speak absent. The liana *Mucuna gigantea* was common; the inflorescences hung down from the crowns of the trees, the peduncles were 15 to 20 m long, or even longer, and at the end was the inflorescence proper with its greenish white flowers and brown fruits, about 1½ to 2 m above the ground. Living water was restricted to a few rivulets, which, however, entirely run dry in the dry season. Here and there, particularly in the lower parts of the hills, the undergrowth of the wood consisted of dense rattan wildernesses. The ground is, for the greater part, bare and dry, and covered with dry leaves, the layer of humus is thin.

Here and there are a few sandy beaches, and on the west side is a very vast mangrove vegetation, which, however, consists of relatively few species. Many trees of the mangrove had developed into robust specimens. Mangrove also occurs, although to a lesser extent, on the south coast near the campong Marégé.

Plants found in the island of Djampea.

Pteridophyta.

1. Lygodium flexuosum Sw., 20 m, D. 1578 — 2. Adiantum lunulatum BURM., D. 1636 — 3. Anthrophium callifolium BL., D. 1558 — 4. A. immersum METT., D. 1566 — 5. Asplenium adiantoides C. CHR., D. 1569, 1596 — 6. A. Nidus L., 400 m, D. s. n. — 7. Dryopteris concolor KUHN, D. 1622 — 8. D. mollis HIERON., D. 1559 — 9. Hemigramme latifolia COPEL., 150 m, D. 1620 — 10. Leptochilus virens C. CHR., 150 m, D. 1621 — 11. Pteris quadriaurita RETZ., 200 m, D. 1616, 1629 — 12. P. cretica L., D. 1635 — 13. P. ensiformis BURM., D. 1561, 1619.

Dicotyledonae.

14. Ficus retusa L., D. 1590 — 15. Phyllochlamys taxoides KOORD., D. 1615 — 16. Piper bantamense BL., D. 1625 — 17. P. betle L., D. 1097 — 18. P. caninum BL., D. 1637 — 19. P. retrofractum VAHL, D. 1627 — 20. P. sarmentosum ROXB., D. 1552 — 21. Cyathula prostrata BL., D. 1614 — 22. Boerhaavia diffusa L., D. 1603 — 23. Portulaca oleracea L., D. 1638 — 24. Codiaeum Stellingianum WARB., 400 m, D. 1566, 1567 — 25. C. Cumingii MUELL.-ARG., D. 1613 — 26. Anomianthus auritus BACK., D. 1643 — 27. Unona discolor VAHL, D. 1546, 1579, 1624 — 28. Stephania Forsteri A. GRAY, D. 1626 — 29. Begonia species, 300 m, D. 1568 — 30. Tetracera scandens MERR., D. 1640 — 31. Pithecolobium umbellatum BENTH., D. 1598 — 32. Caesalpinia Nuga AIT., D. 1591 — 33. Cassia alata L., D. 1574 — 34. C. occidentalis L., D. 1548 — 35. Canavalia ensiformis DC., D. 1655 — 36. Indigofera suffruticosa MILL., D. 1606 — 37. Desmodium umbellatum DC., D. 1517 — 38. Mucuna gigantea DC., 100 m, D. s. n. — 39. Pongamia pinnata MERR., D. 1650 — 40. Psophocarpus tetragonolobus DC., D. 1581 — 41. Sophora tomentosa L., D. 1512, 1539 — 42. Cynometra ramiflora L., D. 1570 — 43. Terminalia Catappa L., D. 1594, 1599 — 44. Sonneratia alba SM., D. 1654 — 45. Ludwigia parviflora ROXB., D. 1575 — 46. Bruguiera caryophylloides BL., D. 1642 — 47. B. gymnorrhiza LAMK., D. 1641 — 48. Rhizophora mucronata LAMK., D. 1649 — 49. R. stylosa GRIFF., D. 1618 — 50. Hibiscus surattensis L., D. 1557 — 51. H. tiliaceus L., D. 1573, 1600; 300 m, D. 1571 — 52. Sida cordifolia L., D. 1645 — 53. S. thyrsiflora MIQ., D. 1586 — 54. Pterospermum acerifolium WILLD., D. 1623 — 55. Micromelum pubescens BL., D. 1550 — 56. Glycosmis cochinchinensis PIERRE, D. s. n. — 57. Canarium commune

L., D. 1551 — 58. Xylocarpus moluccensis ROEM., D. 1588 — 59. Cardiopteris lobata WALL., D. 1612 — 60. Cissus adnata ROXB., D. 1589 — 61. Leea angulata KORTH., D. 1631 — 62. Tetrastigma lanceolarium PLANCH., D. 1553 — 63. Aegiceras floridum R. et SCH., D. 1593, 1653 — 64. Embelia philippinensis DC., D. 1549 — 65. Diospyros maritima BL., D. 1587 — 66. Stictocardia species, D. 1595 — 67. Merremia hastata HALL.f., D. 1604 — 68. Cordia Myxa L., D. 1601 — 69. Physalis minima L., D. 1639 — 70. Limnophila species, D. 1585 — 71. Torenia species, D. 1634 — 72. Josephinia imperatricis VENT., D. 1560 — 73. Acanthus ilicifolius L., D. 1646 — 74. Pseuderanthemum diversifolium MIQ., D. 1584 — 75. Ruellia repens L., D. 1577 — 76. Clerodendron Blumeanum SCHAUER, D. 1630 — 77. C. inerme GAERTN., D. 1652 — 78. Vitex pubescens VAHL, D. 1592 — 79. Coleus atropurpureus BENTH., D. 1651 — 80. Hyptis capitata JACQ., D. 1554, 1644 — 81. H. suaveolens POIT., D. 1647 — 82. Alstonia scholaris R. BR., 300 m, D. 1572 — 83. Rauwolfia amsoniifolia DC., 50 m, D. 1628 — 84. Gymnanthera paludosa BL., D. 1643 — 85. Geophila herbacea O. K., D. 1610 — 86. Ophiorrhiza neglecta BL., 400 m, D. 1573 — 87. Coccinea cordifolia COGN., D. 1582 — 88. Melothria perpusilla COGN., D. 1576 — 89. Momordica Charantia L., 30 m, D. 1583 — 90. Ageratum conyzoides L., D. 1605 — 91. Erigeron linifolius WILLD., D. 1611.

Monocotyledonae.

92. Aneilema nudiflorum R. BR., 60 m, D. 1632 — 93. Cyperus diffusus VAHL, 300 m, D. 1564 — 94. C. dilutus VAHL, D. 1608 — 95. Centotheca latifolia TRIN., 200 m, D. 1562 — 96. Eragrostis amabilis O. K., D. 1607 — 97. Imperata cylindrica P. B., D. s. n. — 98. Panicum trigonum RETZ, D. 1580 — 99. Calamus species, 150 m, D. 1565 — 100. Cocos nucifera L., D. s. n. — 101. Homalomena species, D. 1617.

12. CONCLUSION.

We have seen from the descriptions of the vegetations of the various islands that the vegetation may be called relatively poor. It stands to reason that when the investigations will be resumed, and if more time is available, many names of plants will be added to the plant-lists. General conclusions may yet be drawn from what has been found so far. From the fact that the vegetation is so very poor we may infer that the soil is not very fertile, and from the extreme scarcity of epiphytes that the atmosphere is dry. On my numerous excursions in the Malay Archipelago I have never seen a place where epiphytes are so

scarce and have so poorly developed. The dry season prevails for a very long time (cf. paragraph 3 on the climate). In Bonerate are found vast wildernesses of *Andropogon contortus*, a species of grass which mainly occurs in places with a strongly prevailing east-monsoon. In the island situated most easterly, Kalaotoa, I found *Setaria verticillata*, a species of grass which, in the Netherlands Indies, is only found in the very dry island Soemba and on the extreme north-east of Java, where the east-monsoon is also strongly prevailing.

An other remarkable and rare species of grass, *Asthenochloa tenera*, (see HENRARD, 1929, p. 579) was collected at an altitude of about 100 m on a limestone hill in the southern part of Salajar. So far this grass has been found on the slopes of Mt Idjen in East Java, between 200 and 1000 m above sea-level, and in the Philippine Islands.

Remarkably small is the number of new species found in this territory which as yet has been investigated so very seldom. There will probably be new species among the *Orchidaceae* which have not yet been identified, and it is likely that the *Begonia* found in Djampea is also an unknown species. The following new species have been described as occurring only in Kalaotoa: *Clerodendron kalaotoense* H. J. LAM (LAM, 1919, p. 307) and *Quisqualis sulcata* v. SL. (VAN SLOOTEN, 1924, p. 61); a variety of this species: var. *subcordata* v. SL. (VAN SLOOTEN, 1924, p. 62) has been found in the island Wetar near Timor, so that *Q. sulcata* can hardly be called endemic. There are species which do not occur west of Celebes, for instance *Amylotheca stenopetala* DANS. is known as occurring in Flores and has been found all over Celebes (see DANSER, 1931, p. 249); *Strophioblachia fimbricalyx* BOERL. is found in Indo China, and besides only in Celebes and the Philippine islands (see MERRILL, 1926, p. 96); *Vernonia actaea* KOST. is known as occurring in several islands of the Salajar group, and it can certainly not be called rare here, and besides it is found in the island Moena situated to the south-east of Celebes, the Toekangbesi islands, and the Tanimbar islands, see KOSTER (1935, p. 453), and thus I could enumerate a few others. The greater part of the plants, however, is found also in the western parts of the Malay Archipelago; a special relationship with the flora of the neighbouring island Celebes, which is very rich in endemic plants, could not be deduced from the findings. Almost all the plants are species with a wide distribution area.

From the above it may be concluded that the flora of these islands is relatively young, and consists mainly of elements which can easily be dispersed, which indeed are widely spread. The investigation of

Krakatau with its flora, the elements of which are at best 50 years old, has taught us that the immigrating plants are chiefly species with a wide distribution area. The flora of the Salajar islands is far older, but a comparison with the floras of islands such as Borneo and Celebes, both islands with many endemic plants, points to the young age of the flora of the Salajar islands. Geologically too they must be counted among the younger islands of the Malay Archipelago. The islands Djampea and Kalao may be exceptions to this statement, what is known of their floras yet consists of species with a wide distribution area.

The limestone in the soil, which in many islands is present up to the highest parts, must also be looked upon as a cause of the poorly developed vegetation. In the tropics these limestone formations do not bear a typical flora of calciphilous plants; there are a few plants which demand a certain amount of limestone in the soil, but according to VAN STEENIS (1935, p. 35) these are rather kremnophytic forest-plants growing in steep localities; the plants mentioned by him: *Epithema saxatile* BL., *Monophyllaea Horsfieldii* R. BR., and *Stauranthera ecalcarata* R. BR. were, in the Salajar islands, not even found in the grottos. In the well-known limestone caves near Maros (Makassar) in West-Celebes a species of *Monophyllaea* grows in great numbers. The investigation of the flora of Salajar also supports the opinion of VAN STEENIS (1935, p. 36): „I arrive at the conclusion that so far there are no or hardly any data which justify us in speaking of guiding plants for limestone in the Netherlands' Indies." See also VAN DER PIJL, 1933, p. 86.

For lack of data mangrove is not indicated in the islands of the Salajar group on the coloured vegetation map accompanying the above-mentioned article by VAN STEENIS. Mangrove is yet to be found in various islands, particularly on the west side. Tidal forests are on the whole of but small extent; in the island Djampea, however, a large, quiet bay is entirely bordered by one.

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KLIMACHARAKTER UND PFLANZENDECKE VON INSULINDE UND VON AUSTRALIEN

von

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EINLEITUNG.

Im 3. Heft des Jahrganges 1936 der Oesterreichischen Botanischen Zeitschrift veröffentlichte ich einen Aufsatz über „Klimacharakter und Pflanzendecke" (14), in dem ich einen formelmässigen Ausdruck für die Ozeanität des Klimas aufzustellen versuchte. Ich nannte diesen Wert „Ozeanitätsindex" und bestimmte ihn aus der Formel

$$\frac{n \cdot \frac{1}{2}(f_a - f_i)}{(t + 20) \cdot \sqrt{t_a - t_i}},$$

wobei n die Niederschlagssumme des Jahres in cm, f_a das Maximum und f_i das Minimum der relativen Luchtfeuchtigkeit, t die Jahresmitteltemperatur in Celsiusgraden und t_a das Mittel des wärmsten, t_i das Temperaturmittel des kältesten Monats bedeuten. Bei der kartographischen Darstellung der Ozeanität mit Hilfe dieses Wertes zeigte sich eine weitgehende Uebereinstimmung mit den grossen klimabedingten Formationen bzw. Unterformationen, die ich auch am Schlusse der Arbeit tabellarisch zusammenfasste (14, Seite 211/212).

Auf Grund dieser Skizze wandte sich im Herbst 1936 Herr Prof. Dr. H. J. LAM, Direktor des Rijksherbariums in Leiden, an mich mit der Anfrage, ob ich auf Grund ausführlicherer Daten, als mir bisher solche zur Verfügung standen, für Niederländisch-Indien die Ozeanitätsverteilung genauer bestimmen wolle; auf meine bejahende Antwort hin übermittelte mir Herr Direktor Dr. H. J. LAM im Wege des Botanischen Institutes zu Wien die meteorologischen Daten (1, 9, 21), die ich dann noch aus der Bibliothek der Zentralanstalt für Meteorologie und Geodynamik in Wien ergänzen konnte (2, 3, 11, 12). Dabei ergab sich auch die Möglichkeit, auf Australien Rücksicht zu nehmen, so dass ich dieses samt Neuseeland neuerlich in die Untersuchung miteinbezog; dazu wurde ich auch durch die Uebersendung einer ganz neuen Studie über die Vegetationsverhältnisse Australiens (19) bewogen,

die mir Herr WILLIAM HARTLEY, Assistent am Council for Scientific and Industrial Research, Division of Plant Industry, Canberra, übermittelte. Bevor ich an die Besprechung des Themas schreite, möchte ich auch hierorts allen jenen Stellen danken, die mich unterstützt haben, vor allem Herrn Direktor Dr. H. J. LAM (Leiden), Herrn Direktor Dr. F. KNOLL und Prof. Dr. B. SCHUSSNIG (Botanisches Institut Wien), Herrn W. HARTLEY (Canberra), Dr. F. STEINHAUSER (Zentralanstalt f. Meteorologie und Geodynamik in Wien) und Herrn Prof. A. GREGER (Elisabethgymnasium Wien), ohne deren Hilfe diese Studie nicht möglich gewesen wäre.

INSULINDE (Karten 1 u. 2).

Schon seinerzeit (14) hat es sich gezeigt, dass der grösste Teil einen Ozeanitätsindex von über 200 aufweist; nur auf den nördlichen Philippinen, auf den Kleinen Sunda-Inseln (Timor), auf den Inseln der Banda-See und auf Neu Guinea schien der Index auf 100 und darunter zu sinken, wozu wohl die grosse Landmasse Australiens mit ihrer geringen Ozeanität beitragen dürfte. Dieser Einfluss äussert sich auch deutlich in der raschen Abnahme der Ozeanität von West nach Ost auf J a v a (*Karte 1*). Während im Westen der Index im allgemeinen nur im Nordteile unter 300 auf grössere Strecken, am meisten in den Küstengebieten in Nord-Bantam, in Batavia und Cheribon, absinkt, liegt fast der ganze Osten etwa ab den Provinzen Rembang und Madioen in einer Zone unter 250, sogar unter 200. Diese Kontinentalitätszone umfasst ungefähr die Provinzen Rembang und Soerabaja sowie, mit Ausnahme der Vulkanberge, Madioen und Soerakarta und schliesslich den Norden von Kediri, Pasoeroean und Besoeki samt dessen Südspitze, der Halbinsel Blambangan (oder Poerwo); als niederster Wert ergab sich der Index von Asembagoes (Besoeki) mit 130. Die Südküste von Java ist im ganzen ozeanischer; im Westen unterschreitet der Index etwa bis an die Panandjoeng-Bucht und dann noch um Tjilatjap (Banjoemas) 500 nicht, ausgenommen an einem schmalen Streifen an der Wijnkoops-Bucht (Preanger), wo entlang des Tjitaroem und südlich des Pangerango-Massivs eine Zone mit Indices zwischen 300—500 herüberreicht, sowie an der Panandjoeng-Bucht, wo entlang des Tjitandoej etwa bis Poerwokerto und Bandjar ebenfalls Indices zwischen 300—500 vorherrschen. In Ost-Java zeigt die Südküste durchaus Werte unter 300, aber über 250, bloss östlich der Gradjagan-Bucht schliessen sich, wie schon erwähnt, sogar Werte unter 250 an. Nur südlich des G. Semeroe (Pasoeroean) und vom Idjen-Gebirge (Besoeki) her scheinen sich zwei Zonen über 300 bis ans Meer zu erstrecken, die

voneinander durch eine kontinentale Zone zwischen 250—300 entlang des Bondojoedo-Flusses getrennt werden.

Das Innere West-Javas etwa bis zu einer Linie zwischen Pekalongan im Norden und Karanganjar im Süden zeigt gegen das zentrale Gebirge zu immer höhere Werte, die im Pangerango-Gebiet im Süden 700 in Höhen über 3000 m weit überschreiten, ja im Norden bzw. Nordwesten sogar in geringeren Höhen, so zwischen 1100—1300 m, gegen 900 heranreichen. Auch das Gebirge nördlich von Bandoeng erreicht Werte gegen 700. Ebenso zieht sich eine Zone von über 700, die aber wahrscheinlich nicht geschlossen ist, wie dies mangels an Einzelwerten auf Karte 1 aufscheint, von den Bergen im Süden von Preanger (Kawah Tjiwidei) über den G. Galoenggoeng und über das Dieng-Plateau bis zur Talung von Magelang; vielleicht liegt auch der G. Merapi in dieser Zone, doch ergab sich hier kein einziger sicherer Wert zur Berechnung. Auffällig ist in West-Java auch die Umgebung von Bandoeng mit Indices knapp unter 200—250 als eine kontinentale Insel im Regenschatten der umgebenden bis 3000 m ansteigenden Gebirge.

In Ost-Java reichen die Indices selbst auf den Bergstationen, wie im Tengger-Gebirge (Pasoeroean) und am Argopoero, bzw. Jang-Plateau selbst in Höhen zwischen 1700—2200 m nicht mehr auf 500, ja vielfach nicht einmal auf 400, nur im Keloet-Gebirge an der Grenze von Kediri und Pasoeroean übersteigen sie in 1400 m Seehöhe noch knapp 500. Dementsprechend ist das ganze Gebiet weitaus kontinentaler mit Indices zwischen 130 im Norden und 490 im Inneren; inselhaft mit einer Ozeanität von meist nicht viel über 400—450 erheben sich die Bergkuppen. Der gleichen Kontinentalitätszone unter 250 ist auch ganz Madoera zuzurechnen.

Interessant ist auch eine Gegenüberstellung der Durchschnittswerte der Indices in bestimmten Höhen zwischen West- und Ost-Java, die folgende Tabelle zeigt; auf ihr fallen die erste und zweite Höhenstufe (unter 600 m) ungefähr mit der ersten Höhenregion nach Junghuhn, die dritte mit der 2. Region Junghuhns zusammen (10).

Tabelle der durchschnittlichen Indices in bestimmten Höhenstufen.

Höhenstufe	Index in West-Java	Index in Ost-Java
0—300 m	390	260
300—600 m	515	430
600—1400 m	510	320
1400—2100 m	620	340
über 2100 m	770	(nur eine Station)

In beiden Fällen zeigt sich vorerst mit der Höhe eine Zunahme, dann ein Rückgang und schliesslich wieder ein Anstieg, eine Erscheinung, die BROCKMANN-JEROSCH (4) auch von den Schweizer Bergen angibt. Während jedoch im Westen bloss ein schwacher Rückgang zwischen 600—1400 m erfolgt, der, eigentlich innerhalb der vermutlichen Fehlergrenzen von 5 % gelegen (14), fast Null ist bzw. bei entgegengesetzt gerichteten Vorzeichen der mittleren möglichen Fehler überhaupt verschwindet, erreicht im Osten die Ozeanität ihren höchsten Wert zwischen 300—600 m und geht von hier bis 1400 m stark zurück, so dass auch bei Annahme von entgegengesetzten Vorzeichen der mittleren Fehler ein Abstieg um 70 bestehen bleibt. Im Westen steigt die Ozeanität nochmals bei ungefähr 1700 m stark an, im Osten dagegen über 1400 m nur schwach und ohne das frühere Maximum noch zu erreichen. Nach WARMING-GRAEBNER (20) tritt nun in West-Java der echte tropische Regenwald als Nebelwald in Höhen von ca. 1400—1800 m, im Osten dagegen bloss als Talwald und am Fusse der Berge auf. Die Pflanzengeographische Karte in VAN STEENIS (18) zeigt Regenwald (*primair bosch, niet loofverliezend*) besonders in West-Java etwa bis zum Meridian 110° Ost, also in Gegenden, wo die Indices überall 300, ja meist 500 übersteigen. Oestlich der erwähnten Grenzlinie treten Regenwälder nur mehr sehr vereinzelt an den Vulkanbergen auf, so im Keloet-Gebirge, auf dem Ardjoeno, Tengger-Gebirge, Semeroe, Argopoero, Idjen-Gebirge usf., wo ja auch die Indices inselartig eben an den Gebirgen 300—400 überschreiten.

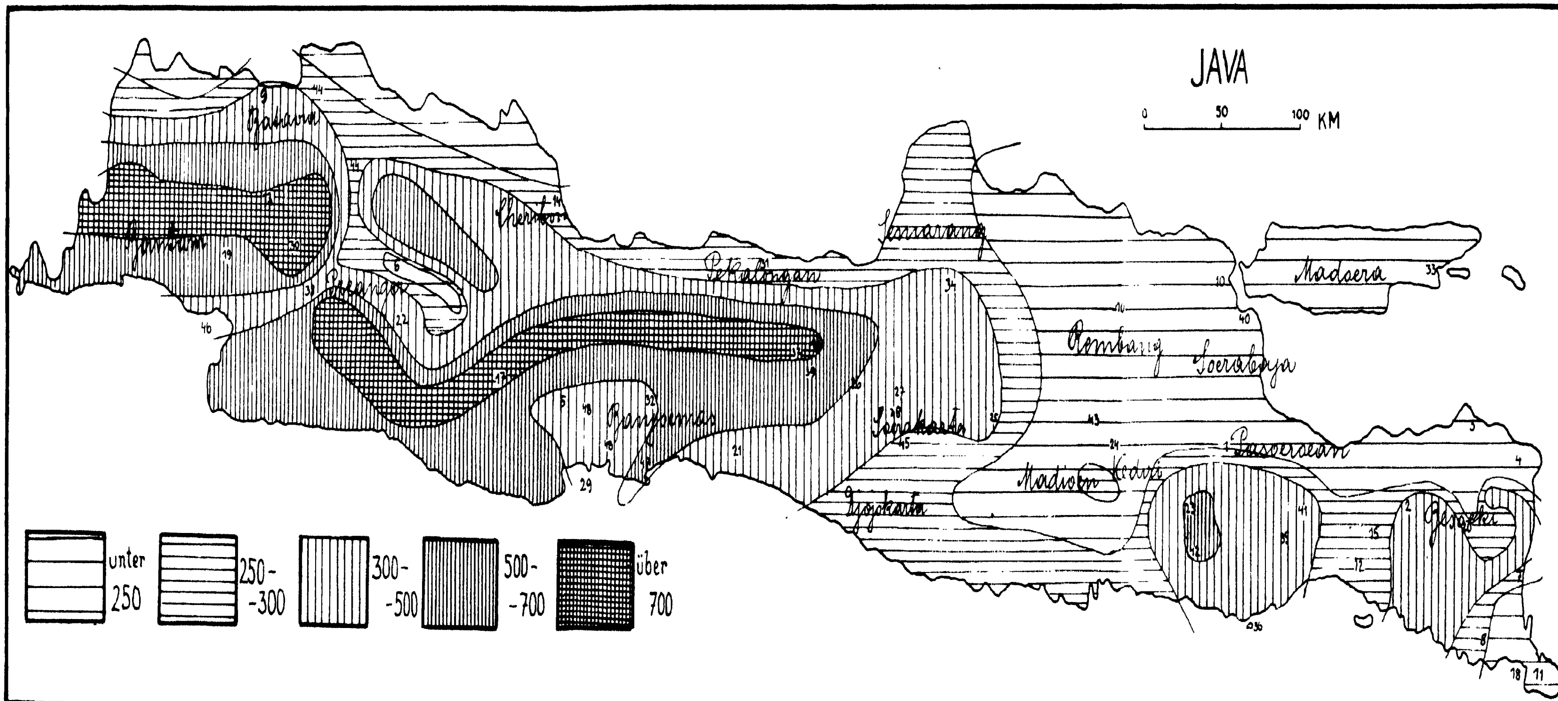
Nur auf der Nordseite von Java in den niedrigeren Teilen von Batavia, von Krawang angefangen über Cheribon und Pekalongan kommen bei Indices unter 300 bzw. 250 die Djati-Wälder (*Tectona grandis*) vor, die dann im kontinentaleren Osten tonangebend werden und heute noch namentlich in den Provinzen Semarang, Madioen, Rembang, Soerabaja sowie Pasoeroean und Besoeki und ehemals auch auf Madoera verbreitet sind bzw. waren, also durchwegs in Landschaften mit Indices vielfach unter 200, jedenfalls aber nicht über 300. Besonders auffällig ist die Uebereinstimmung der Verbreitung des Djati-Waldes mit der Ozeanitätslinie 250 und 300 nicht nur in Cheribon, sondern auch im Süden von Soerakarta und im Osten von Djokjakarta [1]), wohin ebenfalls bis gegen Wedi und dann an die Küste die Ozeanitätslinie 300 und in einigem Abstande nordwärts die Linie 250 nach Westen zurückspringt. Es ist klar, dass verschiedene Einzelheiten schon mit Rücksicht auf den Massstab der Karte und auf die Stationsdichte nicht zum Ausdruck

[1]) Auf Karte 1 steht irrtümlicherweise: Djojokarta.

kommen können, aber im allgemeinen ist die Uebereinstimmung mit den Angaben der VAN STEENIS'schen Karte (18) sehr gross. Nach WARMING-GRAEBNER (20) stellt die Type der Djati-Wälder, die nach Angabe mehreren Autoren hierher von Hinter-Indien verpflanzt worden sein sollen, eine Zwischenform zwischen den echten Regenwäldern (*Pluvii-lignosa*) und den regengrünen Monsunwäldern (*Hiemilignosa*) dar. Auf der Vegetationskarte von VAN STEENIS (18) sind die Tectona-Wälder von den anderen laubwechselnden Waldformationen (*gemengd loofverliezend bosch*) ausgeschieden; diese treten namentlich im Süden der beiden Provinzen Besoeki und Pasoeroean sowie auch in Kediri bei Indexzahlen ebenfalls unter 300, aber meist über 250 auf und weisen als Hauptvertreter verschiedene Akazien-Arten (*Acacia leucophloea, A. tomentosa*) und *Albizzia-Arten* u. a. auf. In der Karte von KOORDERS (10) ist der lichte Sekundärwald, der sich nach der Urwaldrodung und der Auflassung von Pflanzungen sowie auch aus der Strauch-, Gras- und Farnformation entwickelt, von den Savannen nicht geschieden; nach VAN STEENIS (18) ist der Sekundärwald fast ausschliesslich auf West-Java (Bantam, Preanger, namentlich um die Wijnkoops-Bucht) beschränkt, wo die Indices Regenwald anzeigen. Savannen (*savanne met palmen en heestergroepjes*) gibt es nach diesem Autor nur in Nordost- und Südost-Besoeki (östlich Asembagoes und südlich Banjoewangi), wo die Indices zwischen 140 und 230 zu schwanken scheinen.

Die Vulkanberge im Osten Javas etwa ab dem Lawoe bzw. dem Merapi und Merbaboe besiedelt in der Bergregion auch Tjemara-Wald, vorwiegend aus *Casuarina montana* (= *Junghuhniana*); seine Höhenerstreckung nimmt von West nach Ost stark ab. Die Indices schwanken nach dem Kartenbild stark zwischen 300 und 200, dürften sich aber mit Rücksicht auf die Verschiedenheit auf Nord- und Südlagen im Durchschnitt eher dem unteren Werte nähern, da die Tjemara auf Nordseiten bis 1200 m, auf Südseiten bis 2000 m geht. Vielfach tritt auch die Bergtjemara in die Grasformation ein; diese findet sich in kontinentalen Gebieten wie in Ost-Java und auf Madoera, aber auch stellenweise im Westen nach Entwaldung (Brand) und Auflassung von Plantagen als eine Art von Strauch- und Grasformation (*struik-, gras- en varen-wildernis* nach VAN STEENIS), die vielfach in die Savanne übergeht. Namentlich im Osten ist die Alang-Alang-Formation mit *Imperata arundinacea* und *Saccharum spontaneum* verbreitet.

Stellenweise wie am Pangerango findet sich bei sehr hohen Indices und verhältnismässig niedrigen Jahresmitteln (unter 9° C) in grösserer Höhe auch eine Art alpiner Steppe.



KARTE 1 (für die Nummer s. S. 297).

In der Umgebung von Bandoeng ist durch den Feldbau und Plantagenbau die ursprüngliche Vegetation bereits völlig vernichtet, so dass kein Schluss auf die natürliche Pflanzendecke mehr möglich ist; vermutlich dürften sich hier xerophile Formationen befunden haben.

Bei der Betrachtung der Ozeanitätsverteilung trat ein Umstand zutage, der dem Entwurf aller Karten zugute kam. Im Ost- und West-Java, wo verhältnismässig viele Stationen zur Indexberechnung herangezogen werden konnten, fiel das Gebiet mit einem Index unter 250 fast genau mit den Landschaften bis 200 cm Jahresniederschlag zusammen; ebenso deckte sich die Indexzone 250—500 annähernd mit der Niederschlagszone von 200—300 cm. Auch die Zone mit einem Index zwischen 500—700 bzw. 750 zeigte vielfach Aehnlichkeiten mit der Niederschlagszone von 300—400 cm. So konnte namentlich in Mittel-Java, aber auch auf den anderen Inseln, von wo nur sehr wenige Temperaturwerte zur Verfügung standen, die Ozeanitätskarte aus der Regenfallkarte vervollständigt werden, die ja für ganz Niederländisch-Indien sehr ausführlich vorliegt. Ich habe ferner auf Grund der mir zur Verfügung stehenden meteorologischen Daten (11) auch für die anderen tropischen Gebiete die hier gemachte Erfahrung überprüft und im grossen und ganzen bestätigt gefunden. Dagegen liegen in den kühl-gemässigten und ozeanischen Gebieten des pazifischen Nord- und Süd-Amerika die Indices in den entsprechenden Regenzonen niedriger, sobald die Jahresschwankung 10° übersteigt; bei geringerer Amplitude, wie an der chilenischen Küste, tritt auch hier die Uebereinstimmung auf.

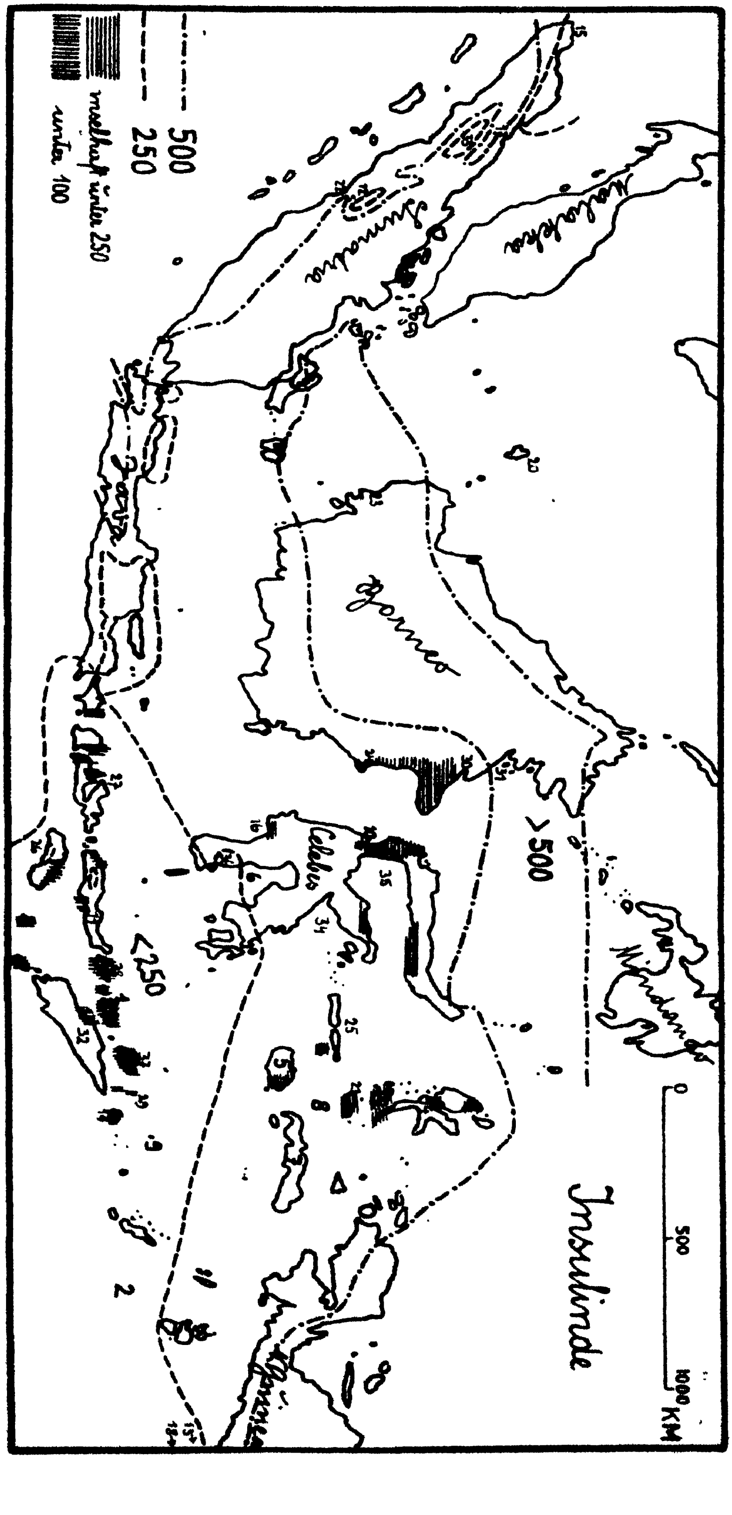
An dieser Stelle möchte ich auch auf eine andere Uebereinstimmung hinweisen, die sowohl auf Java als auch auf der anderen Inselwelt deutlich vor Augen tritt. Lam (13) hat auf Seite 122 in der Figur 2 eine Skizze gegeben, in der er die Orte mit einer bestimmten Anzahl von Regentagen innerhalb der 4 trockensten Monate des Jahres einzeichnet. Dabei zeigt sich (vgl. *Karte 2*), dass die Linie, die Orte unter 20 Regentagen umschliesst, fast genau das Gebiet unter 250 Ozeanität umgreift. In Java gehört der ganze Norden und fast der ganze Osten etwa ab 110° Ost mit Ausnahme der höheren Teile, dann ganz Madoera, ferner die Kleinen Sunda-Inseln dazu; hier fällt auf Flores nach der Karte in Lam (13) die Südwestküste aus dieser Zone heraus, nach der Indexberechnung ergibt sich, dass die Orte, die hier Beobachtungsstationen aufweisen, Indices über 250 haben, jedoch 1200 m hoch mehr im Inneren der Insel liegen. Meines Erachtens hat jedoch die Küste weniger als 250 Ozeanität, die sich eben nur im Gebirge infolge der Steigungsregen hebt, weshalb ich nicht wie Lam eine Ausbuchtung der entsprechenden

Linie nach Norden, sondern ein inselhaftes Vorkommen auf der Karte einzeichnete. Das Gleiche habe ich auch für das Innere und den Südwesten der Insel Soemba angenommen, wo bei Niederschlägen zwischen 200—240 cm der Index über 250 steigen dürfte. Im Norden gehören die Südspitzen der beiden Halbinseln am Golf von Bone auf Celebes samt den vorgelagerten Inseln und inselhaft einige kleinere Flecken bei Watampone und am Golf von Mandar sowie der Ostteil von Boeroe zur Zone des Index unter 250, dann aber in Abweichung von der Kurve bei LAM (13) mit Indices knapp unter 250 die südöstliche Soela-Insel, ein breiter Streif nördlich und südlich am Golf von Tomini auf Nord-Celebes und von hier westwärts bis Ost-Borneo etwa zwischen Samarinda und Tandjoengredeb. Auch einzelne Punkte im Norden und Südosten von Halmahera sowie die Obi-Insel scheinen Indices unter 250 zu haben. Ebenso weist Neu-Guinea zwischen der Frederik-Hendrik-Insel und dem Golf von Papua diese Ozeanität auf.

Die Insel S u m a t r a liegt mit wenigen noch zu besprechenden Ausnahmen durchaus unter einem Index von mehr als 300, der namentlich im Barisan-Gebirge und an der Südwestküste 500 und sogar 700 übersteigt. Die Nordostecke etwa ab Koetaradja bis nordwestlich von Medan liegt unter 250, hier überwiegt nach VAN STEENIS (18) Strauch- und Grasformation und lichter Savannenwald von xerophilem Habitus, stellenweise mit *Pinus Merkusii*, weiter gegen Süden steigt der Index gegen 500; nur im Gebiet des Toba-Sees (Provinz Tapanoeli Nord) findet sich eine grössere kontinentale Insel auch aus den Berechnungen mit Indices nicht viel unter 250, weshalb auch hier wieder xeromorphe Formationen, vornehmlich Savannen anzutreffen sind, soweit nicht Kulturland die Flächen besetzt hat; kleinere Flecken mit Indices unter 250 scheinen auch bei Fort de Kock und Sawahloentoe (Sumatras Westküste) aufzutreten. Hingegen ist der Rest der Insel im wesentlichen von Regenwäldern bedeckt, soweit nicht, wie an der Küste, bodenbedingte Formationen vorherrschen, oder die Urlandschaft der Kultur, bzw. dem nachfolgenden Sekundärwald gewichen ist.

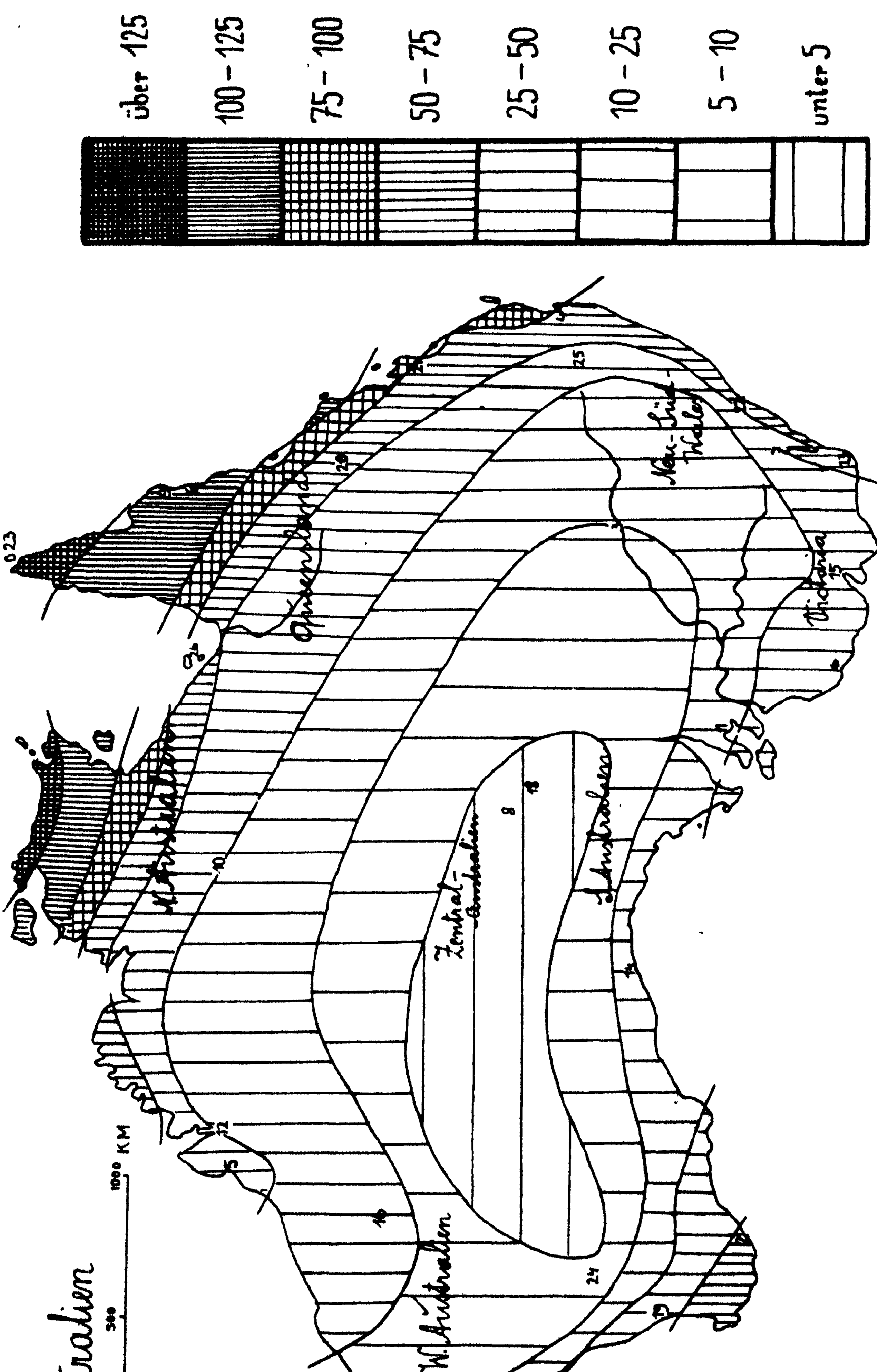
B i l l i t o n mit Ausnahme des Nordrandes und ebenso B a n g k a liegen zwischen 300—500, der Rest der beiden Inseln knapp über 500. Neben Regenwaldresten und kleineren Savannen auf Ost-Billiton herrscht heute hier der Sekundärwald (18).

B o r n e o weist im Inneren sowie an der Südwest- und Nordküste Ozeanität über 500, ja stellenweise, wie in Tarakan, sogar über 800 auf, an der Küste und im Südosten sinkt der Index unter 500, je etwa zwischen Samarinda und Tandjoengredeb, wie schon erwähnt, unter 250.



KARTE 2.

(für die Nummer s. S. 297).



KARTE 3.
(für die Nummer s. S. 298).

Das Innere nimmt in Höhen zwischen 1600—3000 m vielfach Nebelwald ein, darüber dehnt sich stellenweise, wie auf dem Kinabalu in Britisch-Nord-Borneo, alpine Vegetation aus; von der Küste steigt bis dahin meist tropischer Regenwald z. T. *Dipterocarpus*-Wald in verschiedener Abstufung hinan. Nur im Südosten gibt es auch Savannen und hauptsächlich an den Flüssen in West-Borneo (Pontianak) Sekundärwald und Kulturlandschaft.

Auf Celebes dürften die Indices mit Ausnahme des Südens und des Golfs von Tomini sowie einer Zone von hier an die Westküste, wo sie unter 250 bleiben, und auch der Umgebung des Golfs von Tolo, wo sie örtlich 500 übersteigen, zwischen 250 und 500 liegen. Der grösste Teil der Insel ist von Regenwald bestanden, im Gebirge, besonders im Südosten treten *Agathis*-Wälder stellenweise bis 2500 m auf, im Inneren gehört *Agathis* auch mit *Pandanus* der Nebelwaldzone an, die bei etwa 1400 m beginnt. Vor allem im Süden und auch um Donggala stellt sich in niederen Teilen Gras- und Buschformation neben Sekundärwald ein.

Agathis-Wälder finden sich auch neben anderen Regenwaldformen auf allen Inseln rings um die Ceram-See bei Indices über 250, auf Ost-Boeroe tritt auch *Melaleuca*-Wald formationsbildend auf und zwar wahrscheinlich nach Grasbränden in Savannenform ebenso wie auf Ceram, ferner auf Borneo und in Ost-Sumatra.

Neu Guinea gehört im Norden zur Zone über 500, im Osten sinkt der Index ebenso wie im Süden stark ab, wo in Merauke 250 wohl nicht mehr erreicht werden. Nach der Vegetationskarte in H. J. LAM (13) sind gerade hier im Süden an der Torres-Strasse anscheinend die grössten zusammenhängenden Savannengebiete der Insel, vielfach auch mit australischen Typen. Der Rest, abgesehen von edaphischen Formationen und der offenen Formation oberhalb der Waldgrenze im Zentral-Gebirge von Nord-Neu-Guinea, wird durchaus von Regenwald und Regenbergwald eingenommen.

Die Kontinentalitätszone mit einem Index unter 250, ja im Osten vielfach stellenweise unter 100 (vgl. *Karte 2*), erstreckt sich, wie wir schon vorhin gesehen haben (S. 283), von Ost-Java weiter über die Kleinen Sunda-Inseln und über Timor wohl bis an die Arafoera-See und nach dem Süden von Neu-Guinea. Daher nehmen den grössten Teil dieser Inseln Savannen sowie Strauch- und Grasformationen ein, soweit nicht Kulturflächen die ursprüngliche Pflanzenwelt verdrängt haben. Auf allen Kleinen Sunda-Inseln tritt wieder *Casuarina*-Wald (*Casuarina Junghuhniana*) auf, der aber hier zum Beispiel auf Timor schon bei 300 m seine Grenze findet. Er reicht ostwärts über Flores, die Solor- und Alor-Inseln bis zu den

Südwest-Inseln. Auch Djati-Walder sind auf den Kleinen Sunda-Inseln verbreitet. Regenwälder finden sich über grosse Flächen eigentlich nur bis Soembawa in den höheren Teilen, die ja, wie wir auf Flores gesehen haben, höhere Indices aufweisen dürften. Dagegen treten ab Mittel-Flores gegen Osten bis Damar und Moa (Südwest-Inseln) *Eukalypten*-Wälder bestandbildend auf, unter die sich, wie auf Wetar, auch australische Akazien-Arten mengen. Nach den spärlichen Indexberechnungen und der Regenfallkarte dürfte an den in der Figur 4 bei VAN STEENIS (18) bezeichneten Stellen der Index zwischen 50 und 75 schwanken, ja auf der letztgenannten Insel vielleicht 50 nicht einmal erreichen. Nur auf Süd-Timor steigt die Zahl über 150. Auch in Australien dehnen sich die meisten Eukalypten-Wälder unter Indexzahlen von 50—70 im Südwesten und bei geringerer Ozeanität auch im Osten und Nordosten aus, wie noch dargelegt werden wird. Diese für die Tropen so kontinentale Zone, die ganz aus dem Rahmen der übrigen Insulinde herausfällt, schliesst südwärts über die Soemba-Insel einerseits an die 125 übersteigende, aber 200 nicht mehr erreichende Zone auf Arnhem-Land (Nord-Australien), anderseits an eine gleich ozeanische Zone auf der Halbinsel York an.

AUSTRALIEN (*Karte 3*) und NEU-SEELAND.

Die Thursday-Insel, die York vorgelagert ist, hat annähernd den gleichen Index wie Süd-Timor, auf Arnhem-Land dürfte er im Norden die gleiche Zahl erreichen, doch nimmt er südwärts gegen das Landinnere sehr rasch ab. Schon bei Pt. Darwin ist die Indexlinie 100 erreicht, die dann quer durch den Carpentaria-Golf an die australische Ostküste zieht, die sie erst südlich Kap Bowling Green (ca 20° S) verlässt. Diese Linie deckt sich teilweise mit der Niederschlagsmenge von 139 cm im Jahr nach den Karten des Bureaus of Meteorology in Melbourne (9, 21). Bis hierher reicht auch das frostfreie Gebiet. Der Streifen von 75—100 Index ist sehr schmal: er reicht südwärts etwa bis zu einer Linie, die von 14° Süd auf Arnhem-Land über Booroloola, die Wellesley-Inseln, Rockhampton bis gegen Grafton südlich von Brisbane zieht. Nach den Vegetationskarten (6, 8, 18) dürfte es sich hier um *Pluviilignosa* (subtropischen Bergwald 15, Rain forest Northern 19) handeln, die am besten an der Ostküste von Queensland ausgebildet sind, wo sie in einem schmalen und oftmals unterbrochenen Streifen etwa ab 13° Süd bis südlich Brisbane, gegen Süden immer zerstreuter auftretend, ziehen, also soweit eben der Index 70 überschreitet (vgl. 14, S. 211, I A b). Die Hauptarten des Holzwuches sind hier *Tarrietia, Flindersia, Dysoxylum, Cedrela, Elaeo-*

carpus, Ficus, Araucaria und auch *Agathis*. Hier in diesem zumindest subtropischen Gebiete werden auch Apfelsinen, Bananen, Ananas u. ä. gebaut, im Osten von Cairns in Queensland bis Grafton in Neu Süd-Wales auch Zuckerrohr bis zu Indices knapp über 70.

Auf Arnhem-Land und in Queensland samt der Halbinsel York mit Ausnahme der früher erwähnten Gebiete an der Küste treten neben verschiedenen Eukalypten *Erythrophlaeum Laboucherii* („Ironwood") und *Melaleuca,* welche Gattung wir schon aus Insulinde kennen gelernt haben, am Goyder-Fluss neben anderen Palmen auch *Livistona Mariae* und weiter im Osten *Pandanus* und *Grevillea* auf. Interessant ist hier auch das Vorkommen einer Imperata-Art (*Imperata cylindrica*), wie sie auch für die Kontinentalzone im Malaiischen Archipel kennzeichnend ist (Tropical open Forest z. T., nach 19).

Landeinwärts geht sowohl auf Arnhem-Land, wo ganz allgemein die Durchdringung der feucht-tropischen Vegetation mit Savannen kennzeichnend ist, als auch auf der Halbinsel York und in Queensland der Regenwald rasch in tropische Baumsavannen mit vorwiegend Eukalyptusbäumen (Tropical Open Forest z. T., nach 19) bei Indices zwischen 70—130 über, die etwa an einer Zone von Wyndham (East Kimberley)—Arnhem-Land bei 14° Süd — südlich des Carpentaria-Golfes — Wurzel der Halbinsel York — Gebirgsfuss der Kordillere in lichte subtropische Eukalyptus-Savannen (Open Grassland Northern) übergehen, in denen Indices zwischen 40—75 vorherrschen. Auch hier dominieren in verstreuten Gruppen neben Eukalypten Akazien und im Westen auch *Hakea*. Dieses Gebiet wird also von der Ozeanitätslinie 50 durchschnitten, die ungefähr von der Kimberley-Küste in West-Australien über den Cambridge-Golf zum innersten Winkel des Carpentaria-Golfes, von hier an den Aussenrand der Kordillere zur Küstenkette etwa im Distrikt Kennedy Nord und entlang der Küste südwärts über Sydney und Eden hinaus verläuft. Diese Linie zeigt auch eine weitgehende Uebereinstimmung mit der Niederschlagslinie, die Orte von 75 cm Jahresniederschlag verbindet.

Landeinwärts von der lichten Eukalyptus-Savanne tritt schliesslich der Baumwuchs nur mehr als Galeriewald auf, die Savanne geht in echte Grassteppen über, die besonders im Kimberley-Distrikt und in den Beckenlandschaften im Osten (Artesisches Becken, am Murray und Darling) bei Indices zwischen 20—35 entwickelt sind, also bei gleichen Indices wie in den Galeriewaldsteppen der Vereinigten Staaten von Amerika.

An das Regenwaldgebiet im Osten des Kontinentes schliesst sich südlich von Brisbane am Aussenrand der Australischen Kordillere von

Neu Süd-Wales über Victoria und weiter bis in den Südost- und Südteil von Süd-Australien wieder ein geschlossenes Waldland an (Close Forest Southern nach 19), in dem verschiedene Eukalypten allenthalben vorherrschen. Im Norden tritt besonders *Araucaria Cunninghamii* im Gebirge dazu, in Victoria *Acacia melanoxylon* und *Fagus Cunninghamii,* deren Waldgebiete stellenweise wie am Mt. Hotham bei Melbourne bis in die Gipfelregion auf 1900 m emporklimmen. In den feuchteren Teilen des Gebirges, etwa wie in den Blauen Bergen, stellen sich bei einer Niederschlagsmenge von 127—140 cm, also bei einem vermutlichen Index um 100 stellenweise Farnwälder ein, ungefähr unter ähnlichen Verhältnissen, wie an der südchilenischen Küste, z. B. auf den Juan-Fernandez-Inseln. Auf den höchsten Bergen, wie am Mt. Kosciusko, tritt nach einer Art Kampfzone zwischen ca 1400—1800 m, die wieder von verschiedenen sehr zerstreut stehenden Eukalyptus-Arten gebildet wird, eine Art alpiner Steppe, bzw. Matte in ca 1800—1900 m Höhe auf, wo die Niederschlagsmenge 152 cm und damit allem Anschein nach auch der Index 150 übersteigt.

Im Südostteile von Süd-Australien finden sich ebenfalls noch kleinere Waldgebiete vorwiegend aus Eukalypten, denen sich aber auch *Casuarina stricta* und *Xanthorrhoea quadrangulata* („Grasbaum") zugesellen; die Indices bewegen sich hier im allgemeinen zwischen 25—40. Diese Waldstreifen mischen sich stellenweise mit den ihnen meist landeinwärts vorgelagerten, eigentlich auf die weitere Umgebung von Adelaide beschränkten offenen Baumsteppe (Open Forest Southern, nach 19), in der der Baumwuchs wieder ausschliesslich von Eukalypten (*Eucalyptus cladocalyx* und *E. diversifolia*) repräsentiert wird. Die Indices liegen hier knapp über 25—30.

Auch im Südwesteck Australiens südlich Perth bis Albany dehnt sich ein Gebiet mit Indices über 50 aus. Landeinwärts von dieser Zone ist durch den ausgedehnten Weizenanbau die Urlandschaft von Eukalyptus- und Buschwald zum grössten Teil verändert worden, man hat auch noch in die Zone des Mallee-Scrub unter 25 Ozeanität den Ackerbau vorgetragen. Von den ursprünglichen Waldelementen ist in dieser extratropischen Savanne (Southern Open Forest nach 19) unter den anderen Eukalypten besonder die Jarra (*Eucalyptus marginata*) hervorzuheben.

Südwestlieh von Albany tritt an deren Stelle bei Indices von 60—70 die Karri (*Eucalyptus diversicolor*) mit mehr als 100 m Höhe, der schönste Baum des Südwestens, der mit anderen Eukalypten, Akazien und *Casuarina glauca* den Hauptteil dieses schmalen Streifens dichten

Waldlandes bestreitet, das an Regenwälder gemahnt (Southern Rain forest nach 19); doch ist auch dieser Karri-Wald seiner Typenzusammensetzung am ehesten mit E. Rübel (15) als extratropische Savanne den *Duriherbosa* unterzuordnen.

Eukalypten treten auch in den Scrub ein und nehmen integrierenden Anteil an dessen Aufbau. Der Scrub ist der mediterranen Macchie verwandt. Er findet sich als Mallee-Scrub namentlich im Südwesten von Neu Süd-Wales, im Nordwesten von Victoria, im Südwesten von West-Australien und in Süd-Australien, seltener und mit dem Akazien-Scrub vermengt auch in Zentral-Australien vor allem südsüdwestlich von Daly Waters. Neben Eukalypten haben noch je nach Lage am Aufbau des Mallee-Scrubs Anteil: *Callitris, Dodonaea, Casuarina lepidophloea* und *C. glauca, Heterodendron oleifolium, Fusanus*-Arten, *Myoporum platycarpum, Eremophila, Grevillea, Hakea, Beyeria, Melaleuca, Leptospermum, Baeckea* u. a., stellenweise wie in West-Australien auch Akazien (19). Der Mallee-Scrub findet im Süden des Kontinents sehr scharf seine Kontinentalitätsgrenze bei einem Index von 10, welche Linie von der Westküste bei Carnarvon quer durch den ganzen Kontinent im Süden bis zur Riverina mit der Nordgrenze des Mallee-Scrubs parallel verläuft. Auch in Zentral-Australien reicht diese Scrubtype nicht über die Indexlinie 10 landeinwärts. Seine obere Ozeanitätsgrenze ist ebenfalls ziemlich scharf mit 25 ausgebildet, nur am Australischen Golf in West-Australien scheint der Index zwischen Albany und Eucla bis etwa 40 Ozeanität zu reichen.

An der Grenze von Zentral-Australien gegen Nord-Australien sowie am Innenrand der Kordilleren in Queensland und stellenweise in Neu Süd-Wales dehnt sich der Akazien-Scrub (Brigalow-Scrub) aus, dort mit Mallee-Scrub, hier mit Savanne und Grassteppe untermischt. In dieser Formation dominieren verschiedene Akazienarten, wie *Acacia harpophylla* mit bläulich-grauem Laub und unruhig verzweigtem knorrigen Stamm, ferner *Acacia Cambagei* u. a., denen sich einzelne Eukalyptus-Arten, auch Casuarinen (*Casuarina lepidophloea*), *Melaleuca* etz. zugesellen. Im Osten durchdringt diese Formation auch die noch zu besprechende *Spinifex*-Flur. Die Ozeanität des Brigalow-Scrub schwankt im Norden zwischen 10 und 25, im Osten anscheinend zwischen 10 und 50, wobei aus den Karten die genaue Verbreitung und damit auch die obere Grenze nicht genau festzustellen ist.

Die dritte Scrub-Type, der Mulga-Scrub, findet sich in breiter Zone etwa südwärts der Linie Onslow—Charlotte Waters—Charleville—Westrand der Kordillere sowie auf der Oberplatte Zentral-Australiens und

schliesst südwärts an den Mallee-Scrub oder die Salzbusch-Formation an (19). Im Westen ist er ziemlich rein ausgebildet, weiter östlich mischt er sich mit der *Spinifex*-Flur und der Salzbusch-Formation. Auch an seinem Aufbau sind verschiedene Akazien-Arten van 5—6 m Höhe in kleinen Gruppen beteiligt, unter die sich sehr vereinzelt vor allem an den Wasserläufen und in den Trockentälern Eukalypten neben *Callitris robusta* und *Casuarina lepidophloea* mengen. Im allgemeinen bleibt im Mulga-Scrub die Ozeanität unter 10, nur im Osten scheint sie namentlich in Queensland nördlich von Bourke auf 15—20 zu steigen; doch ist gerade diese Gegend arm an Stationen, die zur Berechnung herangezogen werden konnten. Die stärkere Kontinentalität, die klimatisch den Mulga-Scrub gegenüber dem Brigalow-Scrub, dem nördliche Akazien-Scrub, unterscheidet, äussert sich auch im Graswuchs, in dem *Spinifex* (*Triodia*), das xerophytischeste Gras Australiens, vorherrscht. Im Osten von West-Australien und in Zentral-Australien sowie in kleineren Teilen in Südwest-Queensland tritt dieses Gras von Hartlaubtypus auch als eigene *Spinifex*-Formation bei Indices unter 15, ja meist unter 10 auf, im Inneren erreicht die Ozeanität sogar nicht einmal mehr 5. An Stelle des Scrub werden auch auf manchen Karten (6) Halbwüsten oder Wüsten angegeben, wo, wie besonders im Westen um den Wendekreis, der Index sogar unter 4 sinkt.

Namentlich am Australischen Golf, von diesem durch einen schmalen Streifen Mallee-Scrub getrennt, dehnt sich ferner bei Indices zwischen 10 und 20 die Salzbuschsteppe aus, in der *Atriplex*-Arten (*Atriplex vesicaria, A. stipitata*) und *Kochia* dominieren; auch verschiedene Hölzer sind beigemischt, die örtlich stark verschieden sind. Diese Formation tritt uns auch im Seengebiet des Staates Süd-Australien und am Darling bei Indices zwischen 5 und 15 entgegen.

T a s m a n i e n schliesst sich ziemlich eng an das Festland an; sein Osten und Norden liegt unter 50 Ozeanität und hat vor allem dichten Eukalyptenwald als ursprüngliche Vegetation. Auch Akazienarten nehmen an seinem Aufbau Anteil wie *Acacia melanoxylon* und *A. dealbata.* Der Westen weist je nach Höhenlage Indices von 70—100 auf und ist auch heute noch ein dichtes Waldland mit *Nothofagus Cunninghamii, Dacrydium Franklinii, Arthrotaxis, Phyllocladus rhomboidalis, Atherosperma moschatum* u. a. sowie Baumfarnen wie *Dicksonia* (19). Im Inneren auf der Hochfläche, die ab 1200—1300 m waldlos ist und Jahresmittel unter 12° sowie nach der Regenkarte Ozeanitätsindices über 100 aufweist, finden sich sogar *Sphagniherbosa,* sowie Heideelemente (*Leptospermum*).

Der Vollständigkeit halber sei hier auch noch N e u - S e e l a n d an-

geschlossen. Dieses zeigt namentlich auf der Südinsel eine reiche Gliederung des Index von West nach Ost. Während die Westküste Indices über 200 aufweist und auch das Innere noch verhältnismässig ozeanisch ist, ist der Osten bedeutend kontinentaler, im allgemeinen zwischen 50 und 100, ja stellenweise, wie in der Canterbury-Ebene bei Christchurch, werden nicht einmal mehr 50 Ozeanität erreicht. Der Westen der Insel trägt daher Farnwälder und Nebelwälder ähnlich den Valdivia-Wäldern Süd-Amerikas, die in Süd-Chile ebenfalls bei Indices über 150 bzw. 200 bis auf 2.000 m von der pazifischen Küste emporsteigen und an den Regenwald der Tropen gemahnen; Rübel (15) stellt sie als ozeanische Regenwälder zu den Laurilignosen. Darüber folgen auf Neuseeland Regengebüsche mit vielen Dornsträuchern. Die höchsten Teile, über die mir mangels an Stationen keine Indexberechnungen möglich waren, besiedelt alpine Flora. Im trockenen Osten treten steppenähnliche Formationen auf, die vielfach an den australischen Scrub gemahnen. Die Nordinsel ist ziemlich gleichmässig ozeanisch, ihre Indices liegen knapp um 100, jedoch ist auch hier der Osten deutlich kontinentaler, am stärksten wohl um die Hawkes-Bay, wo Napier kaum mehr 70 Ozeanität erreichen dürfte. Die Höhen sind daher waldbedeckt, insofern sie nicht über die Waldgrenze hinausreichen; besonders üppig ist das Waldland im Südwesten und auf der Auckland-Halbinsel, wo es subtropischen Einschlag zeigt; hier kommt etwa bis zur Linie Kawhia Harbour im Westen und Bay of Plenty im Osten in prachtvollen Exemplaren die Kauri-Fichte (*Agathis australis*) vor, deren Grenze etwa mit der Indexlinie 100 zusammenfällt; ihre nahe Verwandte, die Damar-Fichte (*Agathis Dammara*) ist ein Bewohner der Malaiischen Inselwelt. Sowohl auf der Nord-Insel als auch auf der Süd-Insel an der Cook-Strasse tritt stellenweise bei Indices um 100 die Myrtaceen-Heide (*Leptospermum scoparium*) auf.

KULTURPFLANZEN.

Zum Abschluss dieser Skizze sei es mir gestattet, einige Worte über die Verbreitung einiger Kulturpflanzen und ihre Ansprüche an die Ozeanität der Klimas zu sprechen. Von den extratropischen Kulturpflanzen möchte ich hier nur auf den Weizen, das Hauptgetreide Australiens, eingehen, da ja auch dieser Kontinent z. B. 1934 mehr als 3 % der gesamten Welternte an Weizen geliefert hat und mit Recht als Kornkammer bezeichnet wird. In den Hauptanbaugebieten, die in nachfolgender Tabelle mit den Indices zusammengefasst sind, liegt die

Hauptanbaugebiete des Weizens in Australien
samt ihrer Ozeanität.

Das ehemalige Buschland in West-Australien ...		20—45
Süd-Australien im Gebiet der Grossen Buchten und der Halbinseln York und Eyre		20—40
Westliches Längstal in Victoria	ca	40
Gippsland östlich von Melbourne	ca	40
Downs zwischen Riverina und Kordilleren		15—35
Wimmera mit den höheren Teilen der Flussebenen (Riverina)		20—25

Ozeanität durchaus zwischen 15 und 45, wobei an der unteren Grenze auch das Trockenfarm-System angewendet wird. Diese Werte stimmen recht gut mit der Ozeanität der allgemeinen Weizenzone auf der ganzen Welt überein, die 50 Ozeanität nur selten übersteigt, worauf ich noch an gesonderter Stelle zurückkommen werde.

Der Weinbau beschränkt sich im allgemeinen auf die kontinentalen Gebiete am Murray mit Indices zwischen 15 und 20 und an den Downs mit Indices zwischen 20 und 35.

Von den tropischen Kulturpflanzen will ich hier nur auf jene eingehen, die sowohl im besprochenen Gebiet als auch in der Weltwirtschaft grössere Bedeutung haben, da die allgemeine Besprechung einer anderen Arbeit vorbehalten ist. Auch können bodengebundene Pflanzen, wie z. B. der Reis, nicht berücksichtigt werden.

Das Zuckerrohr wird hauptsächlich in Mittel- und Ost-Java bis 1000 m gebaut, wo ja auch *Saccharum spontaneum* verbreitet ist. Seine Heimat ist in einer Zone in Süd-Asien zwischen 22—28° Nord und 82—90° Ost am unteren Ganges und Brahmaputra zu suchen (17). Nach meinen Berechnungen (14) bewegt sich dort der Index meist zwischen 70 und 250. Im Zuckeranbaugebiet auf Java erreicht der Index ausser in Banjoemas nirgends Indexzahlen über 300, meist sogar nicht mehr 250. Damit stimmt auch die Angabe (18) überein, dass sein Anbau besonders im Gebiet bis 20 Regentagen in den 4 trockensten Monaten betrieben wird. Zuckerrohr wird auch in Australien in Queensland von Cairns bis Grafton in Neu Süd-Wales gebaut, soweit also die Indices wieder 70 nicht unterschreiten. Allerdings liegt das südliche Anbaugebiet bereits ausserhalb der frostfreien Zone, weshalb hier die Ernte nicht mehr sicher ist, da das Zuckerrohr gegen Frost äusserst empfindlich ist, während ihm Hitze bei genügend hoher Feuchtigkeit nichts anhaben kann.

Kaffee wird besonders auf Java in den Provinzen Bantam, Preanger, Semarang, Madioen und Pasoeroean, an der Westküste Sumatras (Palembang, Benkoelen, Tapanoeli, Atjeh), auf Celebes und Menado sowie Bali und Lombok bis 1000 m gepflanzt (7). In Java liegen diese Gebiete durchaus in Ozeanitätszonen zwischen 300—500, im Westen auch etwas darüber und im Osten darunter. In Sumatra unterschreiten die Indices 130 nicht, auf Celebes und Menado bewegen sie sich knapp über 200, auf Bali und Lombok zwischen 200—250. Nach SPRECHER (17) benötigt *Coffea arabica* eine mittlere Jahrestemperatur von 18—22° und maximal 150 cm Niederschlag, die anderen Kaffeesorten, vor allem *Coffea liberica* 20—25° und maximal 300 cm Niederschlag. Die Indices in der Heimat von *Coffea arabica,* also in Abessinien, sinken nicht unter 90, die der *Coffea liberica* bewegen sich zwischen 200—350; dem Maximum von 300 cm Niederschlag entspricht ein Index von 500 im tropischen Gebiet, dem Maximum von 150 cm etwa ein Index von 110.

In Insulinde wird heute fast ausschliesslich mehr Assam-Tee gebaut. In dessen Heimat sinkt der Index nicht unter 120—190, in Insulinde, wo Tee auf Java vor allem in den Landschaften Garoet, Cheribon, Buitenzorg und Krawang mit dem Zentrum in der Landschaft Preanger (7) (Soekaboemische Landbau-Vereinigung), in Mittel-Java in Pekalongan, Kedoe und Semarang und in Ost-Java am Keloet und Smeroe und in Pasoeroean, ferner an Sumatras Ostküste und an anderen Stellen gebaut wird, bleibt der Index minimal zwischen 125 und 300, während seine obere Grenze weit über 300 steigt. Nach VAN STEENIS (18) und SPRECHER (17) liegt das beste Teekulturgebiet bei 15—22° Jahresmittel in Höhen von 200—2000 m bei mindest 30 Regentagen in den 4 trockensten Monaten und ca 160—240 cm Jahresniederschlag bei hoher Luftfeuchtigkeit; es entsprechen diese Zahlen im Mittel durchaus einem Index von ungefähr 250.

Kakao wird heute besonders in Nord-Celebes, im mittleren und nördlichen Teil von Neu-Guinea, auf Java (Semarang, Pekalongan, Soerakarta, Merapi, Smeroe, Malang, Janggebiet in Besoeki) und an anderen Stellen gezogen. Er verlangt nach SPRECHER (17) ein gleichmässiges Klima von 24—28° Jahresmittel ohne grosse Schwankungen, jedoch mit hoher Luftfeuchtigkeit und mindest 200 cm Niederschlag. Seine Heimat, das Cauca- und Orinoko-Gebiet in Kolumbien bzw. Venezuela sowie das Amazonas-Land weist, soweit dies zu ermitteln war, durchaus Indices zwischen 170—380 auf. In Insulinde zeigt der Index eine untere Grenze von ca 200, gegen oben scheint er wohl 400 noch zu überschreiten.

Kautschukplantagen (*Hevea brasiliensis*) finden sich auf Java

(Batavia, Buitenzorg, Salatiga, Malang usw.) sowie auf Ost-Sumatra und Borneo (7) bei Indices zwischen 300—500. In Brasilien liegt das Heimatsgebiet der *Hevea* in einer Ozeanitätszone zwischen 250—400.

Der Chinarindenbaum wird heute nach VAN GORKOM (7) stellenweise auf Java und Sumatra gepflanzt, die Indices bewegen sich hier zumindest zwischen 300 (Tjibeureum) bis über 500 (Rioeng-Goenoeng, Kawah Tjiwidei). Im Heimatgebiet am Osthang der südamerikanischen Anden liegen nach der Ozeanitätskarte und nach der Regenmenge die Indices zwischen 275 und ca 500.

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Erklärung der Bezifferung der einzelnen Karten.

Karte 1 (Java).

Ardjoeno	1
Argopoero	2
Asembagoes	3
Baloeran-Gebirge	4
Bandjar	5
Bandoeng	6
Bangelan	42
Banjoewangi	7
Baroe-Fluss	8
Batavia	9
Bengawan-Fluss	10
Blambangan-Halbinsel	11
Bondojoedo-Fluss	12
Buitenzorg	13
Cheribon	14
Djatiroto	15
(Djeng-)Dieng-Plateau	16
Galoenggoeng	17
Gradjagan-Bucht	18
Halimoen-Gebirge	19
Idjen-Gebirge	20
Karanganjar	21
Kawah Tjiwidei	22
Kediri	24
Keloet-Gebirge	23
Lawoe	25
Magelang	26
Merbaboe	27
Merapi	28
Ngandjoek	43
Panandjoeng-Bucht	29
Pangerango	30
Pekalongan	31
Poerwokerto	32
Sarokka	33
Sawahan	34
Smeroe	35
Sempoe	36
Sindoro	37
Soekaboemi	38
Soemboeng	39
Soerabaja	40
Tengger-Gebirge	41
Tjilatjap	47
Tjitandoej	48
Tjitaroem	44
Wedi	45
Wijnkoops-Bucht	46

Karte 2 (Insulinde).

Alor-Inseln	1
Arafoera-See	2
Bangka	3
Billiton	4
Boeroe	5
Bone-Golf	6
Ceram-Insel	7
Ceram-See	8
Damar-Insel	9
Donggala	10
Flores	11
Ft. de Kock	12
Frederik-Hendrik-Insel	13
Halmahera	14
Koetaradja	15

Karte 3 (Australien).

A STUDY IN THE GENUS VULPIA

by

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In recent times, agrostologists have gradually found that the old system of the family of the grasses can no longer be accepted as a natural one and many changements are proposed by various authors. Not being satisfied with the thirteen tribes, accepted by BENTHAM and HOOKER and by HACKEL, many authors preferred to give a new arrangement because it is unpractical to divide so large a family in but thirteen tribes; consequently they introduced a greater number of tribes or groups. Especially the tribe of the *Chlorideae* is a very unnatural one, as there are brought together a great many very different and certainly not allied genera. The tribe of the *Festuceae* is another example of such a *mixtum compositum* and the subdivisions accepted in this tribe are once more very unnatural. Especially the reduction of the uppermost florets in the spikelet is not such an important character, as it is running through the whole family of the grasses. In applying this character such genera as *Melica* and *Glyceria* are widely separated, although they are in my opinion closely allied. ASCHERSON and GRAEBNER indicated already in their well-known Synopsis that it is striking that the genus *Glyceria* agrees with *Melica* as to the closed sheaths and the form of the stigmas. I found the hyaline margins and the summit of the lemmas always much agreeing in both genera. I saw recently to my surprise that this old idea was strongly propagated by the russian botanist NEVSKY, who placed *Glyceria* and a few other genera in the separate tribe of the *Meliceae*. This author proposed a quite different arrangement of other groups of the *Festuceae* and his expositions are in my opinion an important move in the right direction. His tribe of the *Bromeae* with a new classification of the genera is at the moment more natural, as the old genus *Bromus* is

purified by elimination of aberrant genera, although the author proposes perhaps far too much genera. I will deal with this question in a separate paper on *Bromus* before long. Since very large genera as *Andropogon* and *Panicum* are gradually divided into more natural ones by excluding very different groups, it is quite rational to give also a new grouping of the plants belonging to the genus *Festuca* as it was accepted by HOOKER, BENTHAM and HACKEL. On studying the genus *Festuca* as treated by ASCHERSON and GRAEBNER in their Synopsis, we find that *Festuca* is a mixtum of very different genera; these genera are so different, that it is impossible to place all of them, even as sections of the large genus *Festuca* in a natural system.

It is therefore necessary to limit the genus *Festuca* and to accept for this genus the treatment as it is given in HACKEL's admirable monograph of the genus *Festuca*. We all agree that the section *Atropis* in ASCHERSON's Synopsis represents a very good and distinct genus, but at the same time we must go on and accept definitively such genera as *Nardurus* REICHB., *Catapodium* LINK, *Scleropoa* GRISEB., *Desmazeria* DUMORT., *Cutandia* WILLK., *Sphenopus* TRIN. and *Vulpia* GMELIN. Although I am convinced that these genera and some other ones, not mentioned here, are very natural, it is not yet possible to give a sharp definition of them, because it is very probable that some species now accepted as a member of one of those genera, may belong to one of the others, as there are some species which are at the moment not yet fully known in all their characters. In HACKEL's monograph, cited above, many of the genera enumerated by me, were excluded by him and in modern time, the late SAINT YVES who treated the genus *Festuca* so extensively, accepted *Festuca* quite in the same sense of HACKEL's monograph. The genus *Atropis* (*Puccinellia*) is now universally recognized as distinct and taken up already in HACKEL's treatment in ENGLER and PRANTL's Pflanzenreich, but the genus *Festuca* was accepted there with *Vulpia* and *Nardurus* as subgenera. The true genus *Festuca* comprises no annual plants; with some rare exceptions in *Vulpia*, all the other genera mentioned above contain but annual species.

A much advanced treatment of the *Festuceae* was already given by BATTANDIER and TRABUT in their „Flore de l'Algérie", Monocotyledones (1895) p. 120—122. In that work the following genera are recognized: *Sphenopus*, *Vulpia*, *Ctenopsis*, *Desmazeria*, *Catapodium*, *Nardurus*, *Scleropoa*, *Cutandia* and *Vulpiella*. *Festuca* is accepted in the sense of HACKEL. *Catapodium* is a mixture of *Eucatapodium*, *Castellia* and *Agropyropsis*. The latter was recently published as a new genus by

Miss CAMUS and placed in the *Hordeae*. *Nardurus* contains the *Vulpia cynosuroides* PARL., which is better to retain in the genus *Vulpia* and *Cutandia* of BATTANDIER and TRABUT is a mixtum of the true *Cutandias* and the *Vulpia incrassata* SALZM., for which is proposed a new subgenus *Vulpiella*. The species is, however, better retained in the genus *Vulpia*, In their „Flore analytique et synoptique de l'Algérie et de la Tunésie", the authors BATTANDIER and TRABUT gave in the year 1902 the same arrangement.

It is not my intention to give here the grouping of the different genera of the tribe of the *Festuceae*, subtribe *Festucineae* ASCHERS. et GRAEBN. (Synopsis II p. 437), as I wish to treat in this paper the genus *Vulpia* more extensively.

GMELIN established the genus *Vulpia* in the year 1805 and based it on the *Festuca Myurus* of LINNÉ as described in the first edition of the Species Plantarum in 1753. This species is well-known to all agrostologists of Central Europe and represented by the type in the herbarium of LINNÉ. All the botanists who have seen it, especially MUNRO and PARLATORE, agree as to the identity with the plant commonly so called. That LINNÉ himself, in the second edition of the Species Plantarum, gave some different characters, which were taken from another South European species, received from LOEFLING, a species with hairy lemmas, is no reason to give to the species, first described by LINNÉ, the name of *Festuca pseudo-myurus* as did SOYER-WILLEMET, who accepted the species with hairy lemmas as the true *Festuca Myurus*. This question is clearly explained by DUVAL-JOUVE and by ASCHERSON. Although DUVAL-JOUVE was a very accurate observer and very familiar with the *Vulpias*, studied so intensively by him, his conclusions are in some cases wrong, as the complete literature was probably not at his disposal or some publications were overlooked by him. His observations of the plants are, however, of great importance and his conclusions are, as I will show, easy to correct.

GMELIN's genus *Vulpia* was published in his Flora Badensis (1805). We find there on p. 1 under the CLASSIS MONANDRIA, DIGYNIA, *Gramineae* sub V. VULPIA: *Cal.* Gluma 5-flora. *Cor.* Gluma 2-valvis. On p. 8 of his work, the genus was described as a new one with the following description: „*Calyx Gluma* subquinqueflora, bivalvis, inaequalis: exterior minima lanceolata: interior major lineari-lanceolata, mucrone membranaceo terminata. *Corolla Gluma* bivalvis inaequalis, diaphana: *Valvula* exterior major, apice longe aristata. *Stamen* unicum. *Styli* duo. *Semen* tenue teretiusculum utrinque acutum, longitudinaliter sulco exaratum,

corolla tectum." This description of the genus is followed by a diagnosis, reading: „7 VULPIA Myurus panicula spicata, subsecunda, flosculis longe aristatis, scabris," and the different references to LINNé, POLLICH, HALLER, HUDSON and SCHEUCHZER. *Icon. Leers fl. Herborn.* t. 3 *f.* 5. *p.* 34. GMELIN gives further an important observation: „a Festucae genere maxime recedunt Festuca Myurus, F. pilosa et F. sciuroides ob calycis et corollae structuram et Stamen semper unicum. Stamen semper unicum in F. pilosa et Sciuroide in Castilia copiose obvenientibus vidi; in F. Myuro et Sciuroide idem observavit Ill. Roth. Fl. Germ. 2. p. 128—130."

Although GMELIN mentioned two other plants as belonging to this genus, he did not describe them. His *Festuca pilosa* which is the *Festuca ciliata* of DANTHOINE, is a nomen nudum, which is regrettable, since DANTHOINE's name is not valid and ASCHERSON's new name *Festuca Danthonii* disputable on account of the intricating synonymy. GMELIN correctly understood the *Festuca sciuroides,* described by ROTH in the year 1789, but he did not make the combination *Vulpia sciuroides* GMELIN in the year 1805 as is given in ASCHERSON's Synopsis. We find this new combination much later in GMELIN's Supplement to his Flora Badensis (1826) p. 66. In KUNTH's Enumeratio Plantarum (Agrostographia Synoptica sive Enumeratio Graminearum) Vol. I. (1833) p. 396—397, the references to GMELIN are wrongly given as to the page 215 of GMELIN's work and in NEES's Agrostographia Capensis (1841) p. 440 under *Vulpia,* the citation pag. 215 is copied from KUNTH's work without verifying GMELIN's work, where on p. 215 *Festuca bromoides* is treated and not *Vulpia bromoides* as KUNTH and NEES indicate. *Vulpia Myurus* is easy to recognize when found growing in the fieds of Central Europe; the difficulties to distinguish this species arise when we study the whole area of its dispersion. We now come to another *Vulpia,* described by LINNé as *Festuca bromoides* in the first edition of his Species Plantarum (1753) p. 75 under number 7. In the literature after LINNé we find many different opinions as to what species was so named by him. We know that MUNRO, in a paper on the identification of the Grasses of Linnaeus's Herbarium, published in the Journal of the proceedings of the Linnean Society of London in the year 1862, Vol. VI. p. 45, said under number 7, that the specimen in the herbarium was in his opinion, the same as number 5, the latter being *Festuca Myurus.* PARLATORE had already given the same opinion that *Festuca bromoides* was simply a synonym to *Festuca Myurus* L.. The species in question was thus, according to those authors, described twice by LINNé. When

Ascherson and Graebner in their well-known Synopsis treated the genus *Vulpia* as published by Gmelin, accepting this genus as a section of the genus *Festuca,* they named the plant *Festuca dertonensis* and based this name on the *Bromus dertonensis* Allioni (Flora Pedemontana II. (1785) p. 249) noting, that *Festuca bromoides* belonged partly to this species, although they indicated at the same time: „L. in Herb." Now this *Festuca dertonensis* is much allied to *Festuca Myurus* L. but generally to distinguish at first sight by the habit, being a strictly erect plant with a stiff panicle, with erect, not drooping branches. Those botanists who could study both species in the field will agree with me that they cannot be confounded. Thus it is a fact that Ascherson and Graebner accept the species *Festuca bromoides* of Linné as a mixtum because they place it under the synonyms of *Festuca dertonensis* with the addition: „L. pro parte."

We should like to know what are the reasons why they excluded the name of Linné and therefore we go to the authentic description, which prevails, according to our rules of nomenclature. This description consists of a short diagnosis followed by some references to the prelinnean literature. Linné cited Royen lugdb. 68. Raj. Pluk. and Scheuchz., Anglia and Gallia are given as the habitat. The diagnosis: „panicula secunda, spiculis erectis: calycis altera valvula integra: altera acuminata", perfectly applies to *Festuca dertonensis,* which is the same as *Festuca sciuroides* Roth. It was this species of Roth that was transferred to *Vulpia* as *Vulpia sciuroides* by Gmelin in his Supplement (1826), overlooking the earlier *Bromus dertonensis* of Allioni from the year 1785.

Now it is very curious, that Gmelin treated the *Festuca bromoides* of Linné, on p. 215 of his Flora Badensis, as a true *Festuca,* indicating it as an annual plant, allied to *Vulpia Myurus* or *Festuca Myurus* L. and giving the differences rather extensively, noting however that *Festuca bromoides* has 3 anthers, which cannot be true because *Festuca bromoides* L. has always but one stamen. From Gmelin's exact locality there is no other annual *Festuca* known and it is in my opinion certain that *Festuca bromoides,* as described by Gmelin, is quite the same plant as Roth's *Festuca sciuroides* or Allioni's *Bromus dertonensis.* Important is Gmelin's observation under *Festuca bromoides*: „Ill. Linnaeus optime post F. myuros posuit, nostrates bene multi minus re

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corolla tectum." This description of the genus is followed by a diagnosis, reading: „7 VULPIA Myurus panicula spicata, subsecunda, flosculis longe aristatis, scabris," and the different references to LINNé, POLLICH, HALLER, HUDSON and SCHEUCHZER. *Icon. Leers fl. Herborn.* t. 3 *f.* 5. *p.* 34. GMELIN gives further an important observation: „a Festucae genere maxime recedunt Festuca Myurus, F. pilosa et F. sciuroides ob calycis et corollae structuram et Stamen semper unicum. Stamen semper unicum in F. pilosa et Sciuroide in Castilia copiose obvenientibus vidi; in F. Myuro et Sciuroide idem observavit Ill. Roth. Fl. Germ. 2. p. 128—130."

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dertonensis before him, notwithstanding his wrong indication of the 3 stamens.

In GMELIN's Supplement to his Flora Badensis (1826) he gives on p. 65 additional notes to his *Festuca bromoides,* indicating a variety *β*. „Culmis longioribus tenerioribus, flosculis saepissime monandris. Haec varietas mere differt a Festuca bromoide nostra seu Linnaeana: *Culmis* longioribus gracilioribus. *Flosculis* saepissime monamdris, nec triandris." GMELIN thus found, that his *Festuca bromoides,* not treated by him as a member of his genus *Vulpia,* could have but one stamen, but in saying „saepissime", he is still convinced that the species occurs with 3 stamens too. This follows from a further note by him, reading: „Individua numerosa, circa Carlsruhe examinata, persaepe flosculis triandris, praedita sunt. Individuum a Cl. Vahlio in Fl. Danica et a Cl. Sowerby in Engl. Botany flosculis triandris depictum est." If indeed there are among his numerous specimens from Karlsruhe, plants with three stamens, it is certain that these belonged to a true *Festuca* and not to *Festuca bromoides.* That the cited plates, show flowers which are triandrous, is not so strange; artists who prepared such drawings have often taken all sorts of liberties. At the end of the treatment of *Festuca bromoides,* GMELIN mentions his spanish plant, „Vulpia sciuroides mea, in Castilia lecta, semper monandra, longe differt a Festuca bromoide var. seu F. sciuroide Wibelii, Rothii et Willdenovii".

It may be that GMELIN had the true *Vulpia bromoides* (*sciuroides*) from Spain. This species is not so very common there, I saw it from Castilia nova, in pratis ad Guadarrama, collected by LANGE. This locality is mentioned by WILLKOMM and LANGE in their Prodromus Florae Hispanicae, Vol. I (1870) p. 91. Many other localities under *Vulpia sciuroides* are doubtfully cited and the different species *Vulpia Broteri* BOISS. et REUT. is taken up there as a variety *longearistata* WK.. It is also possible that GMELIN had from Spain the glabrous state of *Festuca ciliata* DANTHOINE, a species much more common there. This glabrous variety of *Festuca ciliata* DANTH. is not so easy to recognize from small forms of *Festuca bromoides* and its relation to *Festuca ciliata* was at the time of GMELIN not yet recognized. I have given here a rather long explanation to demonstrate how intricate the different ideas of a rather common plant were, during a long time, after being described by LINNÉ. Wrong observations by some authors were often accepted and have found their way through the literature up to the present.

DUVAL-JOUVE, who studied the *Vulpias* very extensively, wrote a

very interesting paper: Sur les Vulpia de France, published in Revue des sciences naturelles, in the year 1880. In this paper the name *Vulpia sciuroides* (Roth) Gmelin is accepted although Duval-Jouve was acquainted with the fact that the species was earlier described as *Bromus dertonensis* Allioni (Duv.-Jouve, loc. cit. p. 48). This author says further on p. 31: „quand Linné, dans la première édition du *Species*, établit son *F. bromoides,* il lui attribua aussi deux glumes (calycis valvula integra, altera *acuminata,* p. 75), ce qui convenait très-bien au *V. sciuroides* des modernes. Mais au même lieu, il référait sa plante au *Gramen paniculatum bromoides, minus, paniculis aristatis unam partem spectantibus* de Raius et de Scheuchzer, pag. 297, tab. VI, *fig.* 14, qui est sans conteste le *V. uniglumis* des modernes et s'éloigne du *F. sciuroides* Roth, en ce qu'il a une de ses glumes *rudimentaire,* — minima vixque observabili —, et l'autre longuement subulée, — altera apice suo in aristam desinente —, Scheuchz., pag. 297." Duval-Jouve now exclaims that there is a contradiction between the diagnosis of Linné and the reference.

Although Linné himself changed in the second edition of the Species Plantarum the word „*acuminata*" into „*aristata*", the first description given by him is the valid one and agrees with the *Festuca dertonensis.* Even Hackel and Briquet in their Revision des Graminées de l'herbier d'Albr. de Haller filius, published in the year 1906 in Annuaire du Conservatoire et du Jardin botaniques de Genève, say under *Festuca dertonensis* (loc. cit. p. 83): „Il vaut mieux, à la suite d'Ascherson et Graebner, abandonner le nom linnéen *Festuca bromoides* (1753) qui parait s'appliquer à des plantes différentes et restera toujours inextricable."

Unless we proceed in the study of this question, we cannot come to a decision. Because Linné mentioned under the references at first van Royen's Flora Leidensis, we have to look what Adriaan van Royen has said there on pag. 68 of his *Festuca* no. 5. I think that few botanists and certainly not Duval-Jouve, have verified this citation of Linné. For it is extremely astonishing to see, in van Royen's Flora on pag. 68, that Linné copied the description, given by van Royen in the year 1740, verbatim, using exactly the same diagnosis of van Royen and copying the phrase name too, citing quite as van Royen did: Raj. hist. 1287. Syn. 415. Pluk. alm. 174. t. 33. f. 10. Scheuchz. hist. 297. Fortunately Royen's herbarium contains the sheet, upon which are written by himself in his fine handwriting, exactly the same data as published by him in the year 1740. The annual plants on the sheet are rather small specimens but they belong undoubtedly to the *Festuca sciuroides* of Roth.

I have seen an authentic specimen of ROTH's species, given by ROTH to PERSOON, in the herbarium of the latter. On VAN ROYEN's authentic sheet we find after the diagnosis Roy. prodr. 68, inter parenthesis the word „*bromoides*" in another handwriting and written with a different kind of ink. This was done afterwards by his son DAVID VAN ROYEN.

It was a mistake of VAN ROYEN to place a wrong reference under his *Festuca* no. 5 and LINNÉ copied it without control, as is the case with so many references in LINNÉ's works. He quoted also often wrong plates and wrong citations of old authors and I will give here an example, which was interesting in the course of my investigations for a monograph of the genus *Digitaria.*

LINNÉ cites often phrase names of the work of SLOANE, as he did under *Panicum sanguinale* (spec. plant. p. 57). Now one of the specimens of SLOANE is the well-known *Leptochloa virgata,* so totally different from the crab-grass, as is the name of *Panicum sanguinale*, used by GRONOVIUS. The plate t. 70. f. 2 in SLOANE's work represents this *Leptochloa virgata* too. Now this wrong citation is given once more by LINNÉ in the second edition of the Species Plantarum in the year 1762, but in the same work it is also given under *Cynosurus virgatus* (p. 106), which is *Leptochloa virgata* (L.) P. B. This is correct but LINNÉ probably forgot to remove the wrong synonym under *Panicum sanguinale.* There is no reason to reject the well-known name *Panicum sanguinale,* because this name is based upon LINNÉ's own description and his specimen. In such cases we consider the wrong citations as misinterpretations of the old literature, which are of no influence to the nomenclature of the species.

VAN ROYEN, applying the phrase name „*Gramen paniculatum bromoides, minus*", was certainly struck by the very small specimens he had at hand, the eight plants are indeed scarcely 10 cm high and the panicles have but 2—4 spikelets. In ROYEN's herbarium there is a second sheet with a small label only, reading in VAN ROYEN's hand „5 Festucae variet." and once more in a darker ink in his son's hand the word „*bromoides*". The three specimens are about 25 cm long, the exserted panicles are 5 cm long and all the plants belong to the same species, the *Festuca dertonensis.* They represent the better developed plants.

Now that we know the reasons why there is no accordance between the description of LINNÉ and the references, there are in my opinion no objections to accept for our *Festuca dertonensis* (*sciuroides*) the first epithet *bromoides,* because *Festuca bromoides* L. is cleared up and identified. Belonging to the genus *Vulpia* as accepted in modern time, the species has to bear the name of *Vulpia bromoides* (L.) GRAY in „Natural

Arrangement of British Plants" (1821) p. 124. The same combination was published by DUMORTIER two years later in an often neglected little book „Observations sur les Graminées de la Flore Belgique" by B. C. Dumortier, Tournay (1823) p. 101. DUMORTIER maintains also *Vulpia sciuroides* as a variety, indicating it as *v. sciuroides* DUM. with the characters: Paniculâ basi ramosâ, locustis numerosis. He cites *Festuca sciuroides* ROTH, characteres precedentis, habitus sequentis (that is *V. Myurus* GMEL.), pedunculi adpressi. Field study proves that such more robust forms with branched panicles and more numerous spikelets occur together with depauperate lower plants with few spikelets in each panicle, sothat the variety is not to maintain. I have cultivated *Festuca dertonensis* often in my garden and noted that it is easy to find in the cultures small specimens with reduced panicles and luxuriant ones with longer panicles and numerous spikelets. LANGE's variety *gracilis* of *Vulpia sciuroides,* mentioned by ASCHERSON and GRAEBNER is such a depauperate form and of no value. The var. *Broteri* is the *Vulpia Broteri* BOISS. et REUTER, which is treated by HACKEL in his Catalogue raisonné des graminées du Portugal (1880), as a distinct species.

It is important to note that the name *Festuca bromoides* L. was used for our species by various American agrostologists. PIPER accepted it in his „North American Species of Festuca" (Contrib. U. S. National Herbarium, Vol. X [1906]) under his subgenus *Vulpia* (GMEL.) HACK. on p. 18 and HITCHCOCK used the name in his different works on grasses. Recently, however, in his „Manual of the Grasses of the United States", published in the year 1935, he took up the name *Festuca dertonensis* (ALL.). A. et G., saying that the species has been referred to *Festuca bromoides* L. by American authors (l. c. p. 63). In his list of the synonyms on p. 857 no. 4, he gives the observation that this is the species referred to *Festuca bromoides* L., but that seems to be a mixture; the name being referred to *Festuca Myurus* by European authors. This is not correct. *Festuca bromoides* L. is not a mixture, although European authors, such as ASCHERSON and GRAEBNER refer *Festuca bromoides* partly to *F. dertonensis* and partly to *F. uniglumis.* It is quite impossible to place the name *Festuca bromoides* as a synonym under the very different species, commonly called *Festuca uniglumis* SOLANDER in AITON Hort. Kew. ed. I. 1. (1789) p. 108. The authors of the Synopsis give LINNÉ's name under SOLANDER's species as „pro parte", but „not Herb. Linné". For *Festuca uniglumis* SOL. there is an earlier name, the *Festuca fasciculata* FORSK. Fl. Aeg. (1775) p. 22, a name already used by HACKEL and BRIQUET in their revision of the grasses from the Haller Herbarium

(l. c. p. 81), a name, being, according to those authors „le plus ancien nom, qui doit être rétabli". The same authors express their doubt as to the name of *Stipa membranacea* L., described in the year 1753 in the Species Plantarum p. 560. They affirm that the specimen in the herbarium of LINNÉ belongs to *Festuca fasciculata* and that the type locality is correctly indicated by LINNÉ. If we control the description of *Stipa membranacea* L., we find that it is applicable to *Festuca fasciculata* with exception of the words „panicula laxa".

We have here once more one of those curious questions; how is it possible that LINNÉ, the founder of the genus *Stipa*, could place in that genus so different a plant of the *Festuceae*. Before we explain this, we must first say something about DUVAL-JOUVE's ideas.

DUVAL-JOUVE, very interested in the family of the grasses, wrote in the year 1866 an article „L'Herbier de Linné et les graminées françaises d'après les travaux de Parlatore, Hartman et Munro". This paper was published in the „Bulletin de la Société botanique de France". DUVAL-JOUVE adopted *Stipa membranacea* L., saying that LINK was correct when he conserved this name as *Vulpia membranacea* (L.) LINK. He observed however that PARLATORE pointed out that *Festuca uniglumis* SOL. has a nearly wanting lower glume, whereas *Stipa membranacea* has a more developed one. PARLATORE therefore renamed *Stipa membranacea* and called it *Vulpia Linneana*. In PARLATORE's later works this *Vulpia Linneana* disappears. Indeed the differences are of minor importance. DUVAL-JOUVE had already stated such very small differences and concluded that there are in this case not two different species and that *Stipa membranacea* is identical with our *Vulpia uniglumis*, but 14 years later in his already mentioned work on the *Vulpias* of France, he changed his mind and accepted the name *Vulpia uniglumis* (l. c. p. 32). We find there a very critical study of the various data and all the doubts that are put forward by him. Giving LINNÉ's description in extenso, he says that it is impossible for him to believe that LINNÉ, who described the genus *Stipa* which is strictly one-flowered, could have placed into it a grass, where each spikelet contains 4—6 flowers, each flower without an articulation between the lemma and the awn and with pedicels of the spikelets not being margined nor membranaceous. DUVAL-JOUVE finishes his treatment of this species saying that one may find in the herbarium of Linné on the sheet of *Stipa membranacea* the *Vulpia uniglumis*, as indicated by SMITH, PARLATORE and MUNRO, there is no doubt, but this is in his opinion a transfer, or LINNÉ had been: „le jouet d'une illusion incompréhensible".

Stipa membranacea is a valid name, although given without generic description. This is against our modern rules of nomenclature, compare the case of *Eragrostis minor* HOST, published without description of the genus, the latter being described afterwards in the year 1812 by BEAUVOIS. The name *Eragrostis minor* is therefore rejected and this well-known species has to bear the name *Eragrostis poaeoides* BEAUV.. To avoid many difficulties we have, however, accepted in the rules of nomenclature that in the case of the species of LINNÉ, the names are valid even without generic descriptions. *Stipa, Apluda, Aristida, Andropogon* and so many other genera proposed for the first time in the year 1753 are thus valid, although they are described as genera in the Genera Plantarum ed. V in the year 1754.

Stipa membranacea L., being a *Vulpia,* has therefore to bear the name given by LINK. If we study *Vulpia uniglumis* exactly we can better understand some of LINNÉ's puzzling characters. The pedicels, given as dilatated and membranaceous, are in our species very acute and narrowed towards the base, they are enlarged upwards and broadest at the summit, they look like the long callus of the genus *Stipa*; being more or less compressed, LINNÉ could describe them as ancipitate and somewhat obtuse. In transmitted light the pedicels are thicker and darker at the middle, thinner and somewhat transparant at the sides. With spikelets before us we can understand these characters although they are not extraordinarily striking; it may be that LINNÉ also observed the branches of the panicle and the axis, which are more distinctly compressed and evidently membranaceous. Since the first glume is often but a rudiment, it may be that LINNÉ overlooked it, taking the second glume for the first one and the first lemma for the second glume. *Vulpia uniglumis* has often but two developed flowers and it is thus evident that in such a case LINNÉ saw but one flower. This agrees with our own observations, if we study a detached spikelet superficiously and if we neglect the few short sterile lemmas which moreover easily fall off. If we look at the fertile flowers of the spikelet, we find that among all the *Vulpias* they agree the best with the lemma of a *Stipa,* having a very long awn, as long as the body of the lemma. Now LINNÉ says in his description: „calycis arista longitudinae aristae corollinae", which agrees with the characters of *Vulpia uniglumis.* I observed that the second glume has a total length of 3 cm, the body being as long as the awn, which is about 1,5 cm long; the first lemma was 38—40 mm long and the body of the lemma about 2 cm long. These data are quite in accordance with those given by LINNÉ and cited by me above. Other characters given by

LINNÉ are of minor importance, but they correspond also to *Vulpia uniglumis*. The grass is scarcely a feet high, often less so, the panicle is simple and scarcely divided, quite as in *Vulpia uniglumis*, often not very long and „debilis", and sometimes more or less interrupted (interpreted by LINNÉ as „laxa"). The locality given by LINNÉ is correct as the species is known from Spain. „Habitu Avenae", says LINNÉ, which applies to a more than one-flowered plant with long awns.

If we take all these data into consideration, there is in my opinion no objection to accept the specimen in the herbarium of LINNÉ as representing *Stipa membranacea* and although the name is not well-chosen and the plant placed in a wrong genus, it is not allowed to neglect the name and therefore we have to use the name *Vulpia membranacea* (L.) LINK for the plant commonly named as *Festuca uniglumis* SOLAND. or *Vulpia uniglumis* DUMORT..

There is in LINNÉ's Species Plantarum another *Vulpia*, which was described by him as *Festuca incrassata* L., a name not mentioned in the Index Kewensis. Because this name was published in the first authentic edition, on p. 75 no. 6, it is valid and ought to be accepted by every botanist. Now it is known that in different specimens of the Species Plantarum page 75 is taken away and replaced by another one, where we find under no. 6: *Festuca maritima* L. with a quite different diagnosis and with different references. See for this question WILHELM JUNK's interesting article „Linné's Species Plantarum editio princeps und ihre Varianten mit Beschreibung einer neuen. Mit 12 Facsimile-Tafeln. Berlin 1907." Very worth reading is his page 12, where the various data are mentioned. The new *Festuca maritima*, received by LINNÉ from LOEFLING, was once more published in the second edition of the Species Plantarum. We do not know why LINNÉ ordered, during the printing of his work, to replace page 75 by another one. He probably tried to withdraw his *Festuca incrassata*, because it was based by him partly upon a reference to BARRELIER and SCHEUCHZER, which had become suspect to him.

Going over the diagnosis of *Festuca incrassata*, over the references, the locality and the rather long note, it is interesting to see that *Festuca incrassata* is certainly a *Festuca* from the subgenus *Vulpia* HACK.; being the first name and validly published, it must be applied to a species of *Vulpia*. There is however another *Vulpia* described as *Festuca incrassata* SALZMAN, which was published without any other reference by LOISELEUR in the second edition of his Flora Gallica in the year 1828 (p. 85). The name given by SALZMAN is therefore a homonym. If we

treat this *Vulpia* as a *Festuca,* the nomenclature is easy enough for we have then to look only for a new name to give to the species of SALZMAN, whatever the *Festuca incrassata* further may be. *Festuca incrassata* L., being a *Vulpia,* as I shall explain afterwards, cannot be named *Vulpia incrassata* as there is already a *Vulpia incrassata* PARLATORE (1841), which is based upon *Bromus incrassatus* LAMARCK, Enc. I. (1783) p. 469. In the genus *Vulpia* the combination *Vulpia incrassata* (LAMK.) PARL. is thus valid and to be used for the same species as described in LOISELEUR's Flora. By a curious coincidence both names given by SALZMAN and by LAMARCK belong to the same species although described under two different genera *Bromus* and *Festuca* but with the same specific name. In LOISELEUR's Flora there is no reference to the *Bromus incrassatus* LAMK.. PARLATORE's combination is to be accepted unless there is an earlier name, given before 1783.

Let us first treat LINNé's *Festuca incrassata.* His diagnosis: „panicula subnutante secunda, pedunculis incrassatis, aristis calycinis longitudine flosculorum", points to the species which is generally named *Vulpia ligustica* LINK, which is based upon *Bromus ligusticus* ALLIONI (1785). This species has a secund, lax panicle with nodding branches and the pedicels of the spikelets are compressed, enlarged upwards and obovate, moreover the upper glume is as long as the spikelet, the awn as long as its lemma. In a note LINNé says: „singulare quod pedunculi membranacei floribus fere crassiores. Calycinae aristae non breviores aristis flosculorum". He finds it thus very striking that the pedicels of the spikelets (named pedunculi by him) are nearly thicker than the spikelet and membranaceous, which is however exactly the case in *Vulpia ligustica.* The habitat, given as Spain, is not correct, as *Vulpia ligustica* LINK, although common in Southern Europe, is not known from Spain.

Finally there is LINNé's reference: „Gramen festuceum myurum elatius, spica heteromalla, gracili. Barr. ic. t. 99. f. 2. Scheuch. gram. 293?". SCHEUCHZER's plant does not belong to *Vulpia ligustica.* The latter is SCHEUCHZER's Gramen bromoides festucea tenuique panicula minus p. 296 and was placed by LINNé himself in the second edition of the Species Plantarum wrongly under *Bromus distachyos* (p. 1677) which was published already in Amoen. Acad. IV. (1759) p. 304. This plant is our well-known *Brachypodium distachyon* (L.) ROEM. ET SCH. (1817). SCHEUCHZER's plant under *Festuca incrassata* L. is the well-known *Vulpia Myurus* GMEL..

THELLUNG placed the *Festuca incrassata* L. under *Festuca ligustica* in his Flore adventice de Montpellier. (1912) p. 129 with a query, citing:

„L. Spec. pl., 1753, ed. pristina, p. 75, excl. syn. Barr. — non alior." He had no difficulties with *Vulpia incrassata* PARL., because he placed that plant in another genus on p. 121 of his flora. We find there both *Bromus incrassatus* and *Vulpia incrassata* as *Cutandia incrassata* (LAM.) JACKSON Ind. Kew. (1893) p. 675. This was probably done because BENTHAM, taking up the genus *Cutandia,* described by WILLKOMM in the year 1860, indicated that *Festuca incrassata* SALZMAN belonged to *Cutandia* although BENTHAM did not make new combinations in the genus *Cutandia.* See BENTHAM, Notes on Gramineae, in Journ. Linn. Soc. Botany, Vol. XIX (1881) p. 118 (under *Cutanda*) and further BENTHAM et HOOKER, Genera Plantarum, Vol. III. (1883) p. 1188 (under the correct name *Cutandia*).

Festuca incrassata SALZM. is treated by ASCHERSON and GRAEBNER in their Synopsis as a member of the section *Vulpia.* HACKEL discussed the genus *Cutandia* in the „Moniteur du Jardin Botanique de Tiflis", livr. XXIV (1912). He limited this genus to those species where the axis of the panicle is articulated, such as *Cutandia memphitica* (SPRENG.) RICHTER, *Cutandia dichotoma* (FORSK.) BATT. ET TRAB. and *Cutandia divaricata* (DESF.) RICHTER. He says: „Cutandia incrassata returns to Festuca, the other ones, placed by Bentham in Cutandia go to Scleropoa." The type of WILLKOMM's genus *Cutandia* is *C. scleropoides* WILLK., which is the same as *Cutandia memphitica* (SPRENG.) RICHTER. Only those species which group themselves round this *C. memphitica* are to accept as members of this genus. I have to remark only that the valid combinations in *Cutandia* are those of RICHTER in the year 1890.

Since so many references of LINNé proved to be wrong, as is already explained by me above, the one under his *Festuca incrassata* must be accepted as a misinterpretation and our conclusion is therefore that the diagnosis of LINNé and his description belong very probably to *Vulpia ligustica.* But even if there are objections to place LINNé's species there, we are happy to find that this is not important because a combination with LINNé's species as basis cannot be accepted on account of the existing *Vulpia incrassata* (LAMK.) PARL.. If perhaps the latter has to bear an earlier name, we never can take it up for LINNé's species. Therefore the well-known name *Vulpia ligustica* (ALL.) LINK is safe.

This we cannot say as to the name *Vulpia incrassata* (LAMK.) PARL., for which the date of priority is the year 1783. It is not possible that this species was described between 1753 and 1783? To find it out we must know if there are more species, belonging to *Vulpia,* described by LINNé. Indeed there are still two species, one of them is ***Bromus genicu-***

latus L. described in Mantissa, I. (1767) p. 33., the other is *Bromus stipoides* L., described in Mantissa, II. (1771) p. 557. Both species are placed by Ascherson and Graebner under *Festuca geniculata* Willd., which is the plant generally called *Vulpia geniculata* (L.) Link.

In this case we could presume that Linné described under *Bromus* the same species twice, which, however, appears to be not true on studying the descriptions. Let us first take Linné's *Bromus geniculatus.* This species is accepted by all authors who treated it, as the *Vulpia geniculata* of Link and the specimen in Linné's herbarium is the plant going under Link's name. Fortunately, Linné did not give references but a rather long description of his own. All the characters given by him agree with the type in his herbarium and with the well-known plant, so common in the mediterranean region. This question is quite settled as *Bromus geniculatus* has priority above *Bromus stipoides.* Duval-Jouve accepted both species of *Bromus* of Linné as being the same, an incorrect opinion, copied by Ascherson. He treated the species under *Loretia geniculata* in his *Vulpias* of France (l. c. p. 36) saying that the name *geniculatus* is wrong because the species is far from being always geniculate; he says further: „C'est là ce qui fit que, en 1771, le même auteur, recevant la même plante, — culmis plurimis erectis, — la crut différente et la publia sous le nom de Bromus stipoides, Mant. alt., pag. 557, lui donnant ce nom parce qu'il lui trouvait certains rapports avec son Stipa membranacea, „Diversus a Stipa membranacea et genere et habitu, pedunculis licet conveniat" (l. c. p. 558)". Here the famous French agrostologist was wrong. It is not very probable that Linné afterwards in the second edition of his Mantissa, described the species he had in his herbarium already as *Bromus geniculatus*, once more as *Bromus stipoides.* This *Bromus stipoides* is a *Vulpia* too and indicated as growing in Majorca. From the description which is very different from that of *Bromus geniculatus,* we learn various things for the identification, especially that the leaves are shorter than the culms, the oblong panicle is brownish (which is never the case in *Bromus geniculatus*), the spikelets are placed in clusters of three, the middle one being unispiculate, the lateral ones 2—3-spiculate. Linné says intermedio 1-floro, lateralibus 2—3-floris. He certainly means „spikelets" when saying „flores", because after the character of the compressed, obtuse, upwards broadest pedicels, the „flores" are given as 4-flowered. The calyx is subulate and glabrous and the „corolla petalo exteriore arista recta, longit. floris", which means that the lemma bears an erect awn as long as its body. The linear anthers are yellow, from which we conclude that the flowers are chasmogamic,

in the cleistogamic *Vulpias* the anthers are not linear. Chasmogamic are among the *Vulpias* only *Vulpia Alopecurus* (SCHOUSB.) LINK (which does not come into consideration), further *Vulpia ligustica* (ALL.) LINK (with a very different panicle), *Vulpia sicula* (PRESL) LINK (a quite different perennial species), *Vulpia geniculata* (L.) LINK (described by LINNÉ himself), *Vulpia incrassata* (LAMK.) PARL. and *Vulpia tenuis* (TINEO) PARLATORE. Only the last two species come into consideration to be compared with LINNÉ's *Bromus stipoides*. Both species are, moreover, known from the Baleares, the type locality of *Bromus stipoides*. It is especially the *Vulpia incrassata* PARL. which has the construction of the panicle branches in groups of three as indicated so exactly by LINNÉ. We find further under *Bromus stipoides* more import characters. Differing from *Stipa membranacea* (qui similis in Systema XIII), „et genere et habitu", indeed the habit is very different, „pedunculis licet conveniat", *Stipa membranacea* is thus indeed a *Vulpia*, as already pointed out by me above, „cum stipae aristae semine 4-plo longiores, huic vix seminis longitudine". This agrees too, as *Vulpia membranacea* (*uniglumis*) has often a very long awn, whereas in *Vulpia incrassata* PARL. the awn is scarcely as long as the body of the lemma and mostly much shorter. From all these characters I am convinced that the *Bromus stipoides* L. is a true *Vulpia* which has to bear the name of *Vulpia stipoides* (L.) DUMORTIER, a combination given in the year 1823. Having worked out these different data, I saw to my satisfaction that the name *Festuca stipoides* was accepted for the same species as I did, by RICHTER in his Florae Europae as *Festuca stipoides* (L.) DESFONTAINES.

DESFONTAINES identified indeed the species he treated in his Flora Atlantica with LINNÉ's *Bromus stipoides*, citing LINNÉ and making the combination under *Festuca*. He had, however, a different plant or several different plants before him; nevertheless the combination is valid as the combination is based upon LINNÉ's name. Compare the case of *Digitaria filiformis* (L.) KOELER, a name for an American plant, although KOELER described another European species. I explained this case already in an earlier paper.

Concerning the nomenclature in the genus *Vulpia*, our conclusions are therefore, that of the six species of *Vulpia*, mentioned by LINNÉ under various genera, five have to be accepted under the specific names given by him.

Among the *Vulpias* there are some species where the lemmas have a very long pubescence. The first species is a very beautiful plant, named *Vulpia Alopecuros* (SCHOUSB.) LINK, being described as *Festuca ciliata*

Link in Schrader's Journal f. Botanik II, (1799) p. 315. On account of the earlier *Festuca ciliata* Gouan from the year 1768, this name is invalid. The species is easy recognizable by its very large spikelets, which are, without the awns, about $1\frac{1}{2}$ cm long. The flowers are chasmogamic with 3 stamens.

Another species with very long hairy spikelets is the *Festuca ciliata* of Danthoine, in Lamk. et DC. Fl. Franc. III (1805) p. 55. As is clear from the data given above under *Vulpia Alopecuros,* this name is also a homonym and therefore changed by Ascherson and Graebner into *Festuca Danthonii* in their Synopsis Vol. II. (1901) p. 549, which, transferred to *Vulpia,* becomes *Vulpia Danthonii* Volkart in Schinz et Thellung, Fl. Schweiz, ed. II. p. 57. It was a great pity that such a good specific name as *ciliata* could not been used but the authors of the Synopsis neglected the fact that there were other valid names for the species. They united with their species the *Festuca ambigua* Le Gall, Flore de Morbihan (1852) p. 731, which was transferred to *Vulpia ambigua* by A. G. More in Journ. Linn. Soc. V. (1861) p. 190. In his paper: On the occurrence of Festuca ambigua in the Isle of Wight, he tells us that this grass grows abundantly on the sea-side sandhills or dunes at St. Helen's, in this island. He treated the differences with *Vulpia pseudo-myurus* Soy.-Willem. (which is as we know at present the true linnean *Festuca Myurus*) and with *Vulpia uniglumis.* The latter has 3 stamens and is our *Vulpia membranacea* (L.) Link. More's very interesting article gives us further important notes. He says that the resemblance to *V. uniglumis,* is only superficial, as a closer examination shows the true affinity to *Vulpia pseudo-myurus* (*F. Myurus* L.), with which it agrees in the important character of the single stamen and by the constant presence of both glumes, moreover the upper glume of *Vulpia ambigua* is destitute of the awn, found in *Vulpia uniglumis.*

From these data we clearly gather that *Vulpia ambigua* is totally different from *V. uniglumis* (*membranacea*). Having obtained access to Le Gall's Flore de Morbihan, More feels himself satisfied that his plant, distributed by him formerly as *Vulpia pseudo-myurus,* var. *maritima,* answers to the description of *Festuca ambigua.* Le Gall considered his plant more nearly related to *Vulpia ciliata* Link, (Hort. Berol. I. (1827) p. 147), to which he was disposed to refer his species as a nonciliated variety. It must be admitted that, except for the cilia of the lemmas, *Vulpia ambigua* has very nearly the characters of *Vulpia ciliata.* The *Festuca ambigua* was described from the north-west coast of France as mentioned in the works of Le Gall and Lloyd. More gives a key

to distinguish the 3 species, this key shows clearly that *Vulpia ambigua*, although having lemmas without cilia, is more allied to *Vulpia ciliata* LINK and the proportions of both glumes in *Vulpia ambigua* (1 to 3—6) are nearly the same as in *Vulpia ciliata* (1 to 3—5), although we must not forget that in the true *Vulpia Myurus* GMEL., such proportions occur too. There is known a variety *subuniglumis* HACK. of *Vulpia Myurus* where this proportion is 1 to 5 or even 1 to 10.

DUVAL-JOUVE (Vulpia de France l. c. p. 47) says, however, that *Festuca ambigua* LE GALL belongs to *Vulpia Myurus* GMEL., being: „une forme du littoral de l'Ouest, à glume superieure obtuse (?)." LLOYD has described this upper glume in his Fl. Ouest, ed. 3, p. 371, as acute, obtuse or truncate. Why there occur obtuse upper glumes is clearly explained by DUVAL-JOUVE (l. c. p. 30), the delicate membranous point of the glume breaks off easily as is demonstrated by microscopic examination. The obtuse upper glume is thus an accidental character and there is in my opinion no argument to accept DUVAL-JOUVE's identification. If we have to unite *Vulpia ambigua* with one of the other species of the genus, we have to place it under DANTHOINE's *Festuca ciliata*.

In doing so, the earlier epithet *ambigua* ought to have been accepted for DANTHOINE's species. The Kew Index refers *Festuca ambigua* to *Festuca Myurus*. Now there is still an earlier name, *Vulpia aetnensis* TINEO, Pl. rar. fasc. III. (1846) p. 22, a name accepted by RICHTER as belonging to a distinct species, *Festuca aetnensis*, but placed by ASCHERSON and GRAEBNER as forma *aetnensis* under their *Festuca Danthonii*. This *Vulpia aetnensis*, described from Sicilia, where the *Festuca Danthonii* is common, differs according to the authors of the Synopsis but little from the typical *Festuca Danthonii*, in the longer awns of the lemmas. Going over a rather large material of *Festuca Danthonii*, represented by specimens from West Europe to Asia minor and North Africa, it is easy to see that the awns of the lemmas are very variable in length. Mostly they are about as long or slightly longer than the body but not rarely the awns are up to three times as long as the body and such specimens are not confined to Sicilia.

JANKA published a key to the *Vulpias* in the Oest. Bot. Zeit. XVI (1866) p. 216. Here we find *Vulpia aetnensis*, placed next to his *Vulpia Myurus*; the latter he defines as „arista palea paullo longior; palea inferior margine dense ciliata". This proves that JANKA accepted the *Vulpia Myurus* in the sense of SOYER-WILLEMET, who, as is known, named the true *Festuca Myurus* of LINNÉ as *Festuca pseudo-myurus*. Opposite to the characters of JANKA's *Vulpia Myurus* (our *Vulpia Danthonii*), we

find the characters of *Vulpia aetnensis,* given as: „arista palea 3-plo longior, palea inferior sparse ciliata".

As to the identification of Tineo's *Vulpia aetnensis,* it is interesting to memorate Strobl's work on the flora of Sicilia. He visited the island many times and brought together a very large herbarium of the region of the Nebrodes. For the publication of a flora, he studied the different herbaria concerning the island of Sicilia, among them also Gussone's Herbarium siculum at Napels, which contains the types of Tineo. Strobl's work was published as „Flora der Nebroden mit Bezug auf die Flora ganz Siciliens", in the well-known periodical „Flora" at Regensburg. This work of Strobl was issued in parts during the years 1878—1888. There exist rare copies with consecutive pagination. In such a copy we find that *Vulpia ciliata* Lk. was treated on p. 121 (p. 287—288, as published in Flora 1879) with the varieties *genuina* and *aetnensis.* Strobl says emphatically that *Vulpia aetnensis* was issued as a „species" by Tineo fil. in the year 1846 in Plantarum rariorum Siciliae minus cognitarum fasciculi III. Although Strobl cites „var. aetnensis", we know thus that there is a valid publication of the „species" *Vulpia aetnensis.* I wish to quote here Strobl's phrases, (l. c. p. 121—122). „Diese Pflanze, die ich im „Nachtrage zum Herb. Guss., sowie im Herb. Catania's aus der Hand „Tin. sah, unterscheidet sich von den in Sizilien gewöhnlichen, kleineren „Exemplaren der *ciliata* absolut durch nichts, als durch die spärlicher, und „zwar nur am Rande bewimperten Spelzen, ein Merkmal, das ich auch an „der *ciliata* Istriens, der Nebroden etc. zu wiederholten Malen traf und das „mit der auf dem ganzen Rücken- oder nur auf dem Rücken- und Rand- „nerven bewimperten Hauptform durch die mannigfachsten Uebergänge „verbunden ist, wie ich auch in der That auf dem Originalstandorte Tin. „bei Nicolosi sowohl *cil.*, als *aetn.*, aus auch Zwischenformen antraf; es hat „daher diese Tineische Art kaum den Werth einer Varietät."

Not a single argument can, in my opinion, be found to accept *Vulpia aetnensis* as a different species; it is to be united with *Vulpia Danthonii* and being described already in the year 1846, its name has priority over *Vulpia ambigua* and is to be accepted for our species. Ascherson and Graebner say under *Festuca Danthonii*: „because the name *Festuca ambigua* refers to a not typical form, a new name had to been formed." This is however not according to the rules of nomenclature.

Since Danthoine's species occurs in a glabrous state too, it becomes still more difficult to distinguish it from the *Vulpia Myurus* Gmel. and it is the great merit of Duval-Jouve to have so exactly pointed out the differences. Ascherson's description in the Synopsis (l. c. p. 550) is quite

erroneous, as the small, but distinct lower glume is overlooked, so the upper one was accepted for the lower and consequently the first lower lemma was regarded as the upper glume, indicating this upper glume as „awned", the awn as long as the body of the glume and „long hairy at its base". We know that the second glume is not awned at all and perfectly glabrous, whereas the lowermost lemma is hairy on the back and provided with a long awn, the other lemmas are hairy along their margins. DUVAL-JOUVE gave an excellent description in latin, followed by another one in french (l. c. p. 44—45); although it often much resembles the true *Vulpia Myurus* GMEL., especially in the glabrous state, it is in its biological characters quite different, approaching only to small specimens of *Vulpia Myurus* var. *hirsuta* HACK. from Portugal, where the lemmas are hairy along the margins and often also on the back. This variety is identified by American agrostologists as *Vulpia megalura* (NUTT.) RYDBERG, the latter is accepted by them as a distinct American species, said to be introduced from the New World into Portugal. This *Festuca megalura* NUTT. is often found adventicious in Central Europe, also in the Netherlands by myself. It is, according to PIPER and HITCHCOCK, a remarkably constant species in America. I saw it in herbaria often mixed with the true *Festuca Myurus*, not only in North American but even in South American, but never in Old World collections.

The occurrence of *Vulpia Myurus* GMEL. in South America, leads us to the question, whether there exists in South America another *Vulpia* described by KUNTH in the year 1822 as *Festuca muralis*, which was based upon the *Festuca Myurus* as described by HUMBOLDT, BONPLAND and KUNTH in their Nova Genera. Vol. I. (1815) p. 155 from Quito. The long description, given there, fully applies to our *Vulpia Myurus* GMEL., the lower glume is given as $^1/_3$ as long as the upper one and the lemma as green and scabrous. KUNTH cited in his Synopsis Plantarum. Vol. I. (1822) p. 218, the same description of the Nova Genera and the same locality. He tried to differentiate his *Festuca muralis* but not a single diagnostic character is given. In GAY's Flora Chilena, Tom. VI. (1853) p. 425—426, DESVAUX treated this *Festuca muralis*, giving a latin diagnosis and a long spanish description, mentioning in both, that the palea inferior (lemma) is glabrous or scabrous and with hairs along the margins. In a note he says that the plant is variable but identical with the typical specimens of the *Festuca muralis* of KUNTH. The frequent presence of hairs on the lower palea is, in his opinion, not sufficient to separate the Chilean plant from the European one. If indeed KUNTH had the plant with hairy lemmas before him, he would certainly have indicated that,

but he says only that the flowers are scabrous. Desvaux is rather certain that *Festuca muralis* Kunth does not differ from *Festuca Myurus* L. It is noticeable that in Stuckert's „Tercera Contribución al conocimiento de las gramináceas argentinas", in Anal. Mus. Nac. Buenos Aires. Tom. XIV (1911) p. 116, *Festuca Myurus* and *Festuca muralis* are mentioned as two different species, so that it may be possible that *Festuca muralis* is an allied, hitherto overlooked species. Being a *Vulpia* it must in that case bear the name of **Vulpia muralis** (Kunth) Henr.. In Stuckert's work a spanish description is given, although it is but short, it gives us some characters which do not apply to our european *Vulpia Myurus.* The panicle is described as simple, all the glumes are glabrous, the lanceolate spikelets are compressed with 5—9 flowers, with awns being longer than the length of the lemmas and the latter without hairs. From these data we conclude that Stuckert had here a different species before him. The distribution of this *Festuca muralis* is given by him as Patagonia, Chubut, Buenos Aires and further Chili and Peru. This plant is not mentioned by Hitchcock in his work on the grasses of the High Andes.

There is in South America another puzzling *Vulpia* which was mentioned for the first time by Nees in his Flora Brasiliensis, Vol. II (1829) p. 474. Unfortunately Nees identified it with *Festuca tenella* Willd. and described it under that name. He divided his *Festuca tenella* into two varieties, the var. *spontanea,* with a shorter culm and awns twice as long as the lemmas and a var. *culta* „ex America boreali", with a longer culm and awns shorter than the less scabrous lemmas. To this variety from North America belong all the synonyms given by Nees, also *Festuca octoflora* Walt., the name accepted in the manuals of the grasses of North America. Nees's description points however to the plant collected near Montevideo by Sellow, which was seen by him in the Berlin Herbarium. In his description the awn is given as twice as long as the lemma, whereas in the North American *Festuca octoflora,* according to Piper, the lemma is 5 mm long, with an awn 1—7 mm long. Doell accepted the species under the name of *Festuca tenella* Willd. in Martius's Flora Brasiliensis. Nees recognized the South American plant afterwards as different from the *Festuca octoflora* and named it *Festuca australis,* a name published in the year 1854 by Steudel in his Synopsis Pl. Glum. I. p. 304. *Festuca australis* Nees is accepted by Hitchcock in his work on the Andean grasses and taken up by me as **Vulpia australis** (Nees) Henr. nov. comb..

It is also possible that we have to unite *Vulpia muralis* and *Vulpia australis.* If it would come to that, the species has to bear the name of *Vulpia muralis.* Piper, who treated *Festuca octoflora* in his

work (l. c. p. 11) gives the distribution but says that he did not see specimens from Mexico or from Central or South America, though it is reported from Brazil by DOELL as *Festuca tenella* WILLD.. In Mexico (Lower California) *Vulpia octoflora* (WALT.) RYDBERG was detected in the year 1889 by PALMER, together with its variety **hirtella** (PIPER) HENR. nov. comb. Because DOELL's *Festuca tenella* is the same as *Vulpia australis*, it is possible that *Festuca octoflora* WALT. is not an inhabitant of South America but represented there by the vicarious species *Festuca australis* NEES.

Apart from the two insufficiently known species, there occur in South America four other species. *Festuca megalura* NUTT., *Festuca Myurus* L. and *F. bromoides* GRAY are taken up in the Flora Chilena by DESVAUX, where *Festuca megalura* is not accepted as specifically distinct. We find in Chile a species with hairy spikelets, described as *Festuca eriolepis* DESVAUX, which becomes *Vulpia* **eriolepis** (DESV.) HENR. nov. comb.. We know that STUCKERT mentioned three species for Argentina (*F. muralis, F. Myurus* and *F. sciuroides*) and HITCHCOCK accepted *F. megalura, F. australis* and *F. bromoides*. In his key on p. 319 of the Grasses of the High Andes, HITCHCOCK tried to differentiate *Festuca australis* and *Festuca bromoides*, the lemma of *F. australis* is given as 5 mm long, that of *F. bromoides* as about 1 cm long. I have never seen such long lemmas in *F. bromoides* and PIPER gives them as 7—8 mm long. The distribution of *Festuca australis* is given by HITCHCOCK as throughout South America at temperate altitudes, whereas *Festuca bromoides* is accepted as introduced from Europe in several places in South America. A sharp limitation of the South American *Vulpias* can only be given after a renewed study of the types.

For the flora of Uruguay, ARECHAVALETA (Las Gramíneas Uruguayas, 1894) mentions three species of *Festuca* which belong to the genus *Vulpia*. His *Festuca tenella* WILLD., said to be frequent, is probably identical with *Festuca australis*. His *Festuca geniculata* is not the species so named in our european floras but as to ARECHAVALETA's description and his plate (the latter is named *Festuca geniculata* v. *monandra*) a mixtum of two species, the var. *genuina* is the *Festuca megalura* NUTT. and the var. *glabrescens* is probably the *Festuca Myurus* L.; ARECHAVALETA's *Festuca ciliata* LINK, cited also as *Vulpia Myurus* REICHENBACH, is not our European *Festuca ciliata*, it may be *Festuca bromoides* L.. Two years afterwards, two species were treated by SPEGAZZINI in „Contribucion al estudio de la Flora de la Sierra de la Ventana" p. 74—75. The first species is „*Festuca myurus* LIN. var. *muralis* KNTH—STEUD., l. c., f. 303."

In his Spanish description no differences are found to distinguish the plant from typical *Festuca Myurus* L. The other species of SPEGAZZINI was named by him as *Festuca delicatula* LAG.—STEUD., l. c., f. 34 (wrong indication for f. 304.). As to this description we are inclined to accept this plant as the *Festuca australis* NEES, which has in its habit a great resemblance to the Spanish plant described by LAGASCA, which however belongs to the species with a rather short lower glume, whereas SPEGAZZINI mentions the glumes as being 3 and 5 mm long. ARECHAVALETA's determinations are wholly taken from DOELL's treatment in Flora Brasiliensis, Vol. II. pars 3 (1878) p. 112. We find there: *Festuca tenella* WILLD. which is SELLOW's specimen from Montevideo and the type of *Festuca australis* NEES. The second species is *Festuca geniculata* WILLD. var. *monandra* DOELL, which is quite spurious. DOELL says that the type of *Festuca geniculata* is not rare in Southern Europe and Africa, his variety was represented in the Berlin Herbarium, with a label in French, said to be collected at Buenos Aires. In my opinion this specimen is not from South America and the indication on the label is wrong, the plant, being monandrous, certainly does not belong to *Vulpia geniculata*. The third species is *Festuca ciliata* LINK, the genuine plant is according to DOELL, not collected in South America, his var. *glabrescens*, however, at Montevideo (SELLOW d. 2252 in herb. Berol.), it is given by DOELL as being intermediate between *Festuca ciliata* and *Festuca bromoides*. It is probable that this plant indeed belongs to the latter, which is introduced in many places all over the world.

Finally we would remark that some species of North America are difficult to distinguish, so there are forms of *Vulpia pacifica* (PIPER) RYDBERG which much approach to *Vulpia bromoides* and therefore also to *Vulpia australis* and also to few-flowered specimens of *Vulpia octoflora* RYDB..

Although thus the *Vulpias* are well-recognizable by their general aspect, by their spikelets, being dilatated towards the summit during the flowering-time, and especially by the short filaments and stigmas, which are included between the lemmas and paleas, it is not an easy problem to distinguish the species by constant and sharp characters, which is one of the principal requirements for a key to the species. There are all over the world some 30 species. The *Festuca pectinella* DEL. is not accepted as a member of the genus *Vulpia* but belongs to a distinct genus *Ctenopsis* DENOT.; in this I fully agree with TRABUT and STAPF. In the Old World there are about 20 species, the New World has about 13 ones. Some of them are common to both regions. If we

go over them with the literature at hand, we find a very curious difference as to the treatment of the indumentum of the spikelets. In the American literature, this character of the indumentum is emphatically indicated as very constant and very important to recognize the species, while in the Old World, nearly all the species possess both glabrous spikelets and pubescent or hairy ones, so that we meet with the curious fact that for a key to the American species this character can be accepted and is actually used by PIPER and HITCHCOCK, whereas the same character is unfit for our Old World species.

In order to show this feature more in detail, let us first consider the European species. *Vulpia Alopecuros* (SCHOUSB.) LINK has long-hairy lemmas, but they are perfectly glabrous in var. *glabrata*, there is moreover a variety with all the glumes and lemmas densely hairy, known as var. *lanata*. See WILLKOMM et LANGE, Prod. Fl. Hispan. Vol. I (1870) p. 92. We have already pointed out above that ASCHERSON's *Festuca Danthonii*, typical with hairy lemmas, occurs as a variety with glabrous lemmas, named here *Vulpia aetnensis* TINEO var. **imberbis** (VIS.) HENR. nov. comb.; *Vulpia ligustica* (ALL.) LINK, has a var. *hispidula* PARL. with hairy spikelets. *Vulpia geniculata* (L.) LINK has a variety *ciliata* PARLATORE with ciliate lemmas, this species not rarely occurs in a much more hairy state, described here by me as a new variety: *Vulpia geniculata* (L.) LINK, var. **dasyantha** HENR. nov. var. Pedicelli pubescentes, glumae steriles fertilesque longe adpresse hirsutae. Portugal; bords des champs à Faro, Algarve, 18, IV, 1853, leg. E. BOURGEAU no. 2053 bis (mixed with typical *Vulpia geniculata* under the number 2053). Type in Herb. Lugd.-Bat.. From the same locality there is in our herbarium also a specimen of this new variety, collected by M. GANDOGER in April of the year 1904. The var. *dasyantha* occurs also in Algeria, where it was collected by B. BALANSA. In his collection there is a specimen from the year 1852. Bords de la route conduisant d'Oran à la Sénia, avril, named by him *Vulpia stipoides, var.*. The same variety was also collected by M. GANDOGER in Marocco near Melilla in April 1908. The var. *ciliata* PARL. has glabrous glumes and lemmas which are only sparingly ciliate along the margins, as is exactly indicated by PARLATORE.

Vulpia Myurus (L.) GMEL. has a var. *hirsuta* HACK. in Portugal, which is not distinguishable from the American *Vulpia megalura* (NUTT.) RYDBERG and *Vulpia bromoides* (L.) GRAY, which is always described as having only scabrous lemmas, occurs as a var. *hebestachya* AZNAVOUR with hairy spikelets, described from Constantinopel (Enumération d'espèces nouvelles pour la flore de Constantinople, Magyar Botanikai Lapok.

X. [1911] p. 17). It may be that this var. *hebestachya* belongs to *Vulpia Broteri* Boiss. et Reuter, which is accepted by Ascherson and Graebner as a subspecies of *Festuca dertonensis* (our *Vulpia bromoides*). This very interesting variety is described as having „glumis glumellisque dense hirtulis".

Vulpia delicatula (Lag.) Dumort. var. **hirsuta** Henr. nov. var.

Gluma sterilis superior lemmataque distincte hirsutulae.

Spain; Madrid, cum typo. Herb. Huet de Pavillon par Mr. Boissier, ded. Leresche.

In Herb. Lugd. Bat. sub no. 936, 322—153.

Thus it is a fact that we cannot use the character of the presence or absence of hairs on the spikelets to distinguish the European species, unless we accept all those varieties as species. But on the other hand it is striking that some species as *Vulpia membranacea* (L.) Link are not known with hairy spikelets. The same can be said from *Vulpia* **Teneriffae** (Roth) Henr. nov. comb. described by Roth from the Canaries. The Portuguese *Vulpia Myurus* var. *hirsuta* which is certainly the same as the American *Vulpia megalura* Rydb. ought to be accepted in Europe as a variety together with the hairy varieties which belong to different other species, whereas in America it constitutes a distinct species. In South America both *Vulpia megalura* and *Vulpia Myurus* grow together in the same plot as was seen in specimens collected by Holway in Chile.

Let us now pass in review the North American species as accepted by Piper and by Hitchcock under the genus *Festuca* but transferred by me to the genus *Vulpia*. We have already stated that *Vulpia octoflora* (Walt.) Rydb. occurs with hirtellous spikelets, this variety is not accepted by American agrostologists as a species. All other forms with hairy spikelets are, however, accepted as species. In **Vulpia sciurea** (Nutt.) Henr. nov. comb., the lemmas are appressed-pubescent all over the back. This species is very characteristic by its very small lemmas. *Vulpia pacifica* (Piper) Rydb. has spikelets not at all hirsute. **Vulpia confusa** (Piper) Henr. nov. comb. has hirsute glumes and glabrous lemmas. **Vulpia arida** (Elmer) Henr. nov. comb. has glabrous glumes and densely woolly lemmas. **Vulpia Grayi** (Abrams) Henr. nov. comb. has the spikelets pubescent to villous. *Vulpia reflexa* (Buckley) Rydberg has the lemmas scaberulous only. In *Vulpia microstachys* (Nutt.) Munro the lemmas are pubescent only, whereas in **Vulpia Eastwoodae** (Piper) Henr. nov. comb., the spikelets are wholly pubescent. In **Vulpia Tracyi** (Hitchc.) Henr. nov. comb., the glumes are hispid-villous and the lemmas glabrous. In Europe, agrostologists would have united the four species *Vulpia*

reflexa, V. microstachys, V. Eastwoodae and *V. Tracyi* in one species under the name of *Vulpia microstachys* (NUTT.) MUNRO, whereas *Vulpia pacifica, V. confusa* and *V. Grayi* would represent but one species too. If we accept for the species of the Old World the same principles as for those of the New World, we are obliged to increase the number of Old World species ad infinitum, which is against all natural grouping. The slight although remarkably constant differences in the pubescence of the spikelets, is not only found in the American species but this constancy is observed also in the European varieties, a fact which is connected with the cleistogamic pollination of the genus *Vulpia.* To find an important character, fit for a general key to determine the *Vulpias,* we know that ASCHERSON and GRAEBNER accepted the length of the first glume for a classification, but in such a classification, the *Vulpia Myurus* gives us the greatest difficulties, because the species not rarely occurs with a very minute lower glume, although it is placed in the Synopsis in the group with longer first glumes. I have already called attention to this variety *subuniglumis* HACK., where the lower glume is so short that it reaches only one tenth of the length of the second one and is in this case scarcely 1 mm long.

The classification of the *Vulpias* is greatly hampered because there occur in this genus so often depauperate forms, which are the result of bad conditions during their growth and lack of nourishment. They grow often in sterile sands and on walls; depauperate specimens of *Vulpia Myurus* are scarcely distinguishable from the glabrous variety of *Festuca Danthonii.* American authors had in their own region, to deal with about 12 species only, the pubescent varieties inclusive; it can be calculated how many species we have to accept in the Old World if we follow the American method. As to the length of the first glume in the different species, I must call attention to the fact that the uppermost spikelets of the branches of the panicles have longer first glumes, a character which induced botanists to unite *Vulpia bromoides* and *Vulpia Myurus,* especially in those forms where the panicle of *Vulpia Myurus* is long exserted and not enclosed at the base in the uppermost sheath. Both species have moreover asperulous lemmas and we see therefore that the characters to distinguish them disappear more and more. Only the typical plants of both species are at once recognizable and for such specimens it is not difficult to prepare a key; for the many depauperate specimens, so often found, it is a hopeless task. For other species the proportions of the glumes are very constant. *Vulpia ligustica* and *Vulpia geniculata,* both with 3 stamens, can always be recognized, the former

by its very short lower glume, the latter by the long one. I collected a great many specimens of *Vulpia ligustica* and had never difficulties to distinguish then, even in the depauperate forms, from *Vulpia geniculata*. At the same time I never saw the up to 4 mm long anthers hanging from the spikelets, which can not be expected on account of the very short filaments. The anthers may protrude between the lemmas and paleas but they do not hang out as in other chasmogamic grasses. Although the *Vulpias* are divided into cleistogamic and chasmogamic ones, this character of chasmogamy is here essentially different from that of other chasmogamic grasses. The very short filaments of the stamens are a peculiar character for the genus *Vulpia* and the length of the anthers is a more accidental one and not so important as to make two different genera *Vulpia* and *Loretia*, as did Duval-Jouve.

Finally I will call attention to a recently published paper by F. Hermann in the „Verhandlungen des Botanischen Vereins der Prov. Brandenburg" Jahrg. 76 (1936). In this paper „Aus meinem botanischen Merkbuche VI" the genus *Festuca* is treated and a synoptical key to the related genera is given. This key deals with the genera *Glyceria, Sphenopus, Sclerochloa, Cutandia, Desmazeria, Poa* and *Festuca*. The latter is divided into various so-called „*Rotten*", which may be translated by „*squads*". Hermann's incorporations are not in accordance with taxonomical principles, because under his genus *Festuca*, the following 8 names, *Castellia* Tineo, *Micropyros* Link, *Atropis* Trin., *Vulpia* Gmelin, *Eufestuca* Grisebach, *Scleropoa* Grisebach, *Catapodium* Link and *Nardurus* Rchb. are, according to the authors given behind the names, once more treated as genera (l. c. p. 28). *Vulpia* and *Cutandia* are discussed only, the former with the combinations as given under *Festuca*, the latter however with their combinations as valid under *Cutandia*; *Vulpia* is once more divided into 3 groups. We do not learn what rank they have. The three groups are named *Euvulpia, Ctenopsis* and *Pectinula*, the latter is proposed as new and based upon *Festuca pectinella* which is in reality the type of the genus *Ctenopsis* DeNot. Under *Vulpia* a new species was described by Hermann as *Festuca marmaricae*; this species was already recognized by Hackel and described by him in the year 1880 as a member of the section *Spirachne* of *Vulpia*, under the name of *Vulpia inops* (Dél.) Hack., which is the same as *Vulpia brevis* Boiss. et Reut.. The whole treatment of this group of grasses by Hermann is quite insufficient and incorrect for a good general view and proves that a great deal of the literature of this subject was neglected by him; his ideas are moreover based upon little knowledge of the whole tribe.

Summary.

In conclusion, we propose the following nomenclatural alterations. For a good classification, the genus *Vulpia* is to be accepted as a member of the *Festuceae*. Various names of *Vulpia* are fixed according to our present rules of nomenclature, viz. *V. bromoides* (L.) GRAY, *V. membranacea* (L.) LINK, *V. geniculata* (L.) LINK, *V. stipoides* (L.) DUM. and *V. Myurus* (L.) GMELIN. For *Vulpia ciliata* the earliest valid epithet is taken and so this widely distributed species must bear the name of *V. aetnensis* TINEO, while its glabrous variety is named *imberbis* (VIS.) HENR.. *Vulpia delicatula* (LAG.) DUM. var. *hirsuta* HENR. and *Vulpia geniculata* (L.) LINK var. *dasyantha* HENR. are described as new varieties. Among the South American species the new combinations *Vulpia eriolepis* (DESV.) HENR., *Vulpia australis* (NEES) HENR. and *Vulpia muralis* (KUNTH) HENR. are proposed, moreover the endemic *Vulpia Teneriffae* (ROTH) HENR. is mentioned. The North American species are treated in connection with the parallel variations of the European *Vulpias* and the following new combinations are given, viz. *Vulpia octoflora* (PIPER) RYDBERG, var. *hirtella* (PIPER) HENR., *V. sciurea* (NUTT.) HENR., *V. arida* (ELMER) HENR., *V. confusa* (PIPER) HENR., *V. Eastwoodae* (PIPER) HENR., *V. Grayi* (ABRAMS) HENR. and *V. Tracyi* (HITCHC.) HENR..

CONSERVATION OF LATER GENERIC HOMONYMS:

RHIPIDIUM CORNU VERSUS RHIPIDIUM AUCT.

by

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(Issued April 20th, 1937).

Many plants are as a whole or in some characteristic features flabelliform. So it is easy to understand that botanists often used the word ῥιπίς or ῥιπίδιον as a component of plant names. It is rather astonishing, however, that this word, *R(h)ipidion* or *R(h)ipidium* occurs no less than five times as a generic name (including one nomen nudum). In the list of homonyms by Miss M. L. GREEN c.s. (Kew Bull. misc. Inf., 1935, p. 341--544) the word is not mentioned, though it is of importance for mycologists. It may seem curious that also OTTO KUNTZE, who was very keen on such cases, probably overlooked it. Only in the list of nomina conservanda (auct. R. MAIRE; Int. Rules Nomencl., Ed. III, 1935, p. 124) one of the cases was considered [1]).

Rhipidium CORNU, Bull. Soc. bot. Fr., 18, 1871, p. 58; Ann. Sci. nat. Bot., V, 15, 1872, p. 15. (*Saprolegniaceae*).
Standard species: *Rh. interruptum* CORNU l. c. = *Rh. continuum* CORNU l. c. = *Rh. europaeum* VON MINDEN, Krypt. Fl. Brandenburg, V, 1915, p. 597 (1912). For the argument of typification, see VON MINDEN, l. c., p. 596.

As this genus is generally accepted both by European and American mycologists, it needs conservation against the homonyms mentioned below.

Ripidium J. J. BERNHARDI, SCHRADER's Journal für die Botanik, II, 1800 (1801), p. 127, t. 2, f. 3, based on *R. dichotomum* (L.) BERNH. = *Schizaea dichotoma* (L.) J. E. SMITH, is a synonym of *Schizaea* J. E. SMITH.

[1]) As Candollea VII (1936) was not yet available at the library of the Rijksherbarium owing to the very retarded distribution by the official Exchangebureaus, I do not know if this case was treated in the list of Fern-homonyms on p. 137—139 of that volume.

Rhipidion TARG.-TOZZ., Cat. Veg. Marin. MS, p. 289; manuscript name, published by BERTOLONI, Amoenitates italicae, 1819, p. 312, as a synonym of *Fucus Flabellum* BERT. = *Flabellaria petiolata* (TURRA) TREVISAN [1]). (*Codiaceae*).

Published as a synonym (nomen nudum) it needs no further comment. It was never used by algologists. As the printed Catalogue of G. TARGIONI-TOZZETTI (Catalogus vegetabilium marinorum musei sui, Florentiae 1826) is not available in any public library in Holland, I could not find out if perhaps the name *Rhipidion* was published validly in this work. This may be considered as a question of minor importance.

Ripidium TRIN., Fundam. Agrost., 1820, p. 169.

= *Erianthus* MICHAUX, Flora Bor.-Americ., I, 1803, p. 54. (*Gramineae*).

Rhipidium WALLR., Fl. Crypt. Germ., II, 1833, p. 742. (*Agaricales, Tricholomataceae*).

Based on *Rh. stypticum* WALLR. l. c. = *Agaricus stipticus* BULL., FRIES, S.M. I, 1821, p. 188.

This name is not likely to be revived as it was never used by mycologists. MAIRE (Int. Rules Nomencl., Ed. III, 1935, p. 124) proposes to reject it against *Panus* FR. (type species: *P. torulosus* FR.). According to SINGER's emendation of *Panellus* KARST. (Ann. Myc., 34, 1936, p. 334; B. B. C., 56 B, 1936, p. 141—142) with the acception of *P. stipticus* (BULL. ex FR.) KARST. as a type species, I think it better to reject *Rhipidium* WALLR. in favour of *Panellus* KARST. (Bidr. känned. Finl. Nat. och Folk, 32, 1879, p. XIV, 96; em. Sing., l. c.) (type as indicated).

[1]) According to ENDLICHER, Gen. Plant., 1836—40, p. 9 (1836), *Rhipidion* TARG. is a synonym of *Zonaria* AG. a. *Padina* AD.

NOTES ON CONVERGENCE AND IDENTITY IN RELATION TO ENVIRONMENT.

by

J. G. WOOD (*Adelaide*) and L. G. M. BAAS BECKING (*Leiden*).

Any community of plants is characterized in four main ways — by a definite floristic composition, by definite life-forms, by a definite structure and by a definite habitat or environment.

Of these four characters, floristic composition is the most important in defining a plant community in any particular locality. It is a commonplace fact that many parts of the world may show communities of higher plants identical in life-form, structure and habitat but differing widely in their floristic composition. By utilising the three last named characters of a plant community we can group our unit biocoenoses into larger groups.

Life-form alone is sufficient to define the general types of vegetation which form great zones in different latitudes. Examples are the evergreen needle-leaved coniferous forest, the broad leaved deciduous forests, the hard-leaved sclerophyll scrubs, rain forests, grassland and steppe.

If we take structure and habitat into consideration as well as the life-form, it is possible to define smaller units of vegetation as for example sclerophyll forests and scrubs, savannah forests and so on. Although the floristic composition of these communities is different in different parts of the world, their physiognomy, their general make up and environment are similar. Examples for the sclerophyll scrubs are the maquis or macchia of the Mediterranean coasts, the chapparal of California, the espiñol of Chile and the scrubs of Southern Australia and South Africa. Similar savannah woodlands or forests occur in these same areas. Savannah woodlands dominated by *Quercus* and *Eucalyptus* in California and South Australia respectively, show this convergence in facies of communities in a similar environment, but with entirely different floristic compositions.

Even within a large continent such as Australia, the same vegetation type may show different floristic compositions in different localities.

An example is seen in the high sclerophyll forests of *Eucalyptus* in the Mount Lofty Ranges in South Australia and in the Blue Mountains in New South Wales. In both cases the soil is a podsol poor in mineral nutrients and both are characterized by well-marked alternating wet and dry periods. The faciës is similar and the total number of species in the communities is approximately the same. The character plants of the areas belong to the same genera but to different, but closely allied, species. The following list gives the „abundant" plants in the two areas, but could also be extended to include the „occasional" and „rare" plants where a similar replacement of a species by one closely allied to it will be found.

Characteristic plants of Sclerophyll forests in New South Wales and South Australia.

New South Wales.	*South Australia.*
Eucalyptus piperita	Eucalyptus obliqua
Persoonia salicina	Persoonia juniperina
Leptospermum flavescens	Leptospermum scoparium
Banksia spinulosa	Banksia marginata
Hakea dactyloides	Hakea ulicina
Isopogon anemonifolius	Isopogon ceratophyllus
Dillwynia ericifolia	Dillwynia ericifolia
Acacia discolor	Acacia myrtifolia
Pultenaea scabra	Pultenaea daphnoides
Phyllota phylicoides	Phyllota pleurandroides
Lissanthe sapida	Lissanthe strigosa
Tetratheca ericifolia	Tetratheca pilosa
Epacris grandiflora	Epacris impressa

The same replacement of one species by another closely allied to it can be seen in scrubs on shallow soils or on laterite soils in the two areas and dominated by *Eucalyptus stricta* and *Casuarina distyla* respectively in New South Wales and by *Eucalyptus fasciculosa* and *Casuarina stricta* respectively in South Australia.

The difference in floristic make-up, but convergence in affinities is accounted for by the evolutionary history of the Australian flora. The genera of Eastern Australia are also found in Western Australia. Statistical analysis of the flora shows that the native Australian genera probably arose in the South Western portion of the continent and from this centrum a dispersal of species occurred to the east. In late Creta-

ceous times the eastern and western portions of Australia were virtually separated by a vast sea so that two centres were present in which endemic species could arise. When the Gulf Regions of South Australia were uplifted in Pleistocene times migration occurred from both these centres to give the present flora of South Australia. This isolation of the two parts of the continent accounts for the different floristic composition of similar vegetation types in similar environments in different parts of the continent and there is little doubt that were the flora of Australia more evenly distributed the floristic composition of the sclerophyll forests in different regions would show little variation.

Changes in floristic composition of a vegetation community, occur with changes in the habitat. The factors of the habitat can be grouped under three headings — climatic, soil and biotic factors. The first two are the more important and are not completely independent. With the higher plants, climate especially exerts a sifting effect upon the vegetation. In general, the more extreme the climatic environment becomes, the more specific becomes the plant community in equilibrium with the environment: from a community containing plants belonging to numerous families there is a change to one containing only a few species belonging to a few circumscribed families.

The mechanism of this sifting effect is clear. Owing to deep-seated metabolic changes or owing to structural changes brought about by changed metabolism, certain species in a migrating population of plants will have a better chance of surviving when entering a new environment than other species with less specialised mechanisms. Such plants are often said to be better „adapted" to their environment which does not mean that any change in the Lamarckian sense has occurred but simply that they have a greater survival value, a value which is probably intrinsic in its genetical make-up. They have been selected by the external milieu.

The sifting effect of climate may be seen in the mallee regions of South Australia. The mallee is really a vast ecotone connecting the sclerophyll communities of the south with the arid communities of the north. The terrain is even, the soil type constant throughout and the climate slowly changes from north to south, the chief difference being a range of mean annual rainfall from 20 inches to 8 inches. The only constant species are the mallee eucalypts, *Eucalyptus oleosa* and *E. dumosa*: the associated species slowly change as one progresses northwards until the numerous sclerophyll species of the south are replaced by the few Chenopodiaceae of the north. Finally the mallee eucalypts

themselves disappear and a chenopodiaceous shrub-steppe composed of *Atriplex, Kochia* and *Bassia* species forms the only vegetation of the plains. These genera, or others closely allied to them, are components of arid shrub-steppe in Northern Africa, in Central Asia and in Western America.

In the mallee the concentration of the soil solution increases with decreasing rainfall. The selective effect of climate is seen more clearly perhaps in the case of mangroves where the composition of the soil solution remains approximately constant but the aerial environment changes. In Northern Australia, mangroves belonging to various genera, but especially *Rhizophora, Ceriops, Bruguiera, Aegiceras, Avicennia* and *Sonneratia,* form extensive rain forests along the swampy coasts. As one progresses southwards and the humidity decreases various species drop out from the forest until near Sydney *Avicennia officinalis* and *Aegiceras majus* alone form a forest; whilst in South Australia *Avicennia officinalis* is the only member of the mangrove communities.

When the edaphic milieu becomes more extreme, and especially when the aerial milieu remains approximately constant, the selective effect becomes even more marked; and in a given milieu the same families and frequently the same genera are to be found as components of the biocoenose in all parts of the world. Two examples will serve to illustrate this convergence of floristic units, when the milieu becomes extreme; one is the halophytic vegetation of salt lakes and marshes and the other that of peat bogs and moors.

In South and Central Australia precisely the same species of plants are found in definite zones corresponding to the salt concentration in both coastal swamps and far inland salt lakes. To illustrate the convergence of species we give lists of the character plants in three zones around salt lakes in three regions, one from South Australia, one from the Great Salt Lake at Utah and one from the Caspian Sea. The prominent plants are restricted to a few genera of the Chenopodiaceae.

South Australia (13)	*Utah* (5)	*Caspian Sea* (10)
1. Arthrocnemum arbuscula	1. Salicornia rubra	1. Halocnemum strobilaceum
Salicornia australis	Salicornia utahensis	Salicornia herbacea
2. Arthrocnemum halocnemoides	2. Allenrolfia occidentalis	2. Petrosimonia crassifolia
Suaeda australis	Suaeda erecta	Suaeda maritima
Kochia oppositifolia	Suaeda Moquinii	

South Australia (13)	*Utah* (5)	*Caspian Sea* (10)
3. Distichlis spicata Atriplex paludosum Sporobolus virginicus	3. Distichlis spicata Atriplex hastata	3. Atriplex verruciferum Atriplex canum Anabasis salsa

In high moor bogs the convergence of the flora is equally striking. The most characteristic feature of these bogs is their oligotrophic character, that is, their dearth in mineral substances and their high hydrogen-ion concentration (pH usually about 4.0 to 4.5). We give examples of the typical flora of two such bogs which agree in the above characteristics; but in one the peat is a sphagnum-peat, in the other a sedge-peat. The former is in Drenthe, Holland, the latter at Mt. Compass in South Australia. The flora of the peaty heaths in Drenthe is similar in all respects to that of oligotrophic heaths, described by KOPPE (11) for Northern Europe and by KATZ (9) for Western Siberia.

Drenthe.	Mt. Compass.
1. *Rhynchosporetum albae*	1. *Chorizandretum enodis.*
Rhynchospora alba	Chorizandra enodis (peat former)
Batrachospermum vagum	Batrachospermum moniliforme
Drosera intermedia	Drosera pygmaea
Lycopodium inundatum	Lycopodium carolinianum
Utricularia minor	Utricularia lateriflora
Eriophorum angustifolium	Selaginella Preissiana
Sphagnum recurvum } peat-	Microtis atrata
S. cuspidatum } formers	Levenhookia dubia
2. *Sphagnetum medii.*	2. *Cladietum juncii.*
Vaccinium oxycoccus	Sprengelia incarnata
Andromeda polifolia	Drosera binata
Drosera rotundifolia	
Empetrum nigrum	
Eriophorum vaginatum	
Euphrasia nemorosa	Euphrasia Brownii
Orchis maculata	Diuris palustris
	Microtis porrifolia
Lycopodium clavatum	Lycopodium laterale
Pilularia globifera	Schizaea fistulosa
	Lindsaya linearis

Drenthe.		Mt. Compass.
Blechnum Spicant		Blechnum discolor
Sphagnum medium		Cladium junceum
S. rubellum		Schoenus brevifolius
S. acutifolium	peat-formers	Hypolaena laterifolia
S. molluscum		H. fastigiata
S. recurvum		Leptocarpus tenax
Polytrichum commune		Lepidobolus drapetocoleus
P. strictum		Polytrichium juniperinum
Hypnum sp.		Hypnum sp.
3. *Ericetum Tetralicis.*		3. *Epacridetum impressae.*
Erica Tetralix		Epacris impressa
Calluna vulgaris		Leptospermum scoparium
Molinia coerulea		
Juncus squarrosus		Lepidosperma exaltatum
Scirpus caespitosus		Cladium glomeratum
Carex panicea		Cladium tetragonum
Sphagnum compactum		

In these peats the convergence of the flora owing to the selectivity of the milieu is more striking than that of the salt lakes for the flora is richer. Neglecting the peat-forming elements, the same genera in approximating equal numbers are common to both these widely separated localities.

Aqueous milieu is, in many respects, more homogeneous. The transpiration factor and its deep consequences upon metabolism is excluded. Even if the aqueous milieu changes in „climate" as well as in composition, its homogeneity allows us to characterize it with greater certainty than a subaerial milieu. Peatwater, freshwater and seawater show a number of biocoenoses which would allow of very interesting parallels in the sense given in the „terrestrial" examples. However, this would prove a veritable „mer à boire" and we shall, therefore, pass to slightly more selective environments. Evaporating seawater or inlandwater might reach a certain concentration at which the fresh-water or the marine components markedly decrease in importance, because either the limits of their physical and chemical milieu or the limits of their biotic milieu are reached (e.g. competition). The most striking instance of this biocoenosis we find in the so-called „condensor" stage of solar evaporation of seawater, where the concentration increases from 3.5—

± 12 % total salts, concommittant with the deposition of calcium carbonate. Apart from local (chiefly faunistic) elements this community proves to be similar all over the world. The leading form is here *Ruppia maritima* L.. Although the cosmopolitan nature of this form was recognized by ENGLER (3) as early as 1874, BRAUN BLANQUET mentions its occurrence „in the northern hemisphere" (2). SETCHELL (15) remarks that it occurs „to some extent, at least, even in the southern hemisphere". ASCHERSON (1) discusses its cosmopolitan nature in relation to a possible common origin of the present land masses!

Without embarking upon a discussion of the origin of this distribution, and without considering the modes of dispersal (GRAEBNER, 6), we have to accept the fact that the „Ruppion maritimae" is a cosmopolitan association. In view of the apparent differences of opinion it may be well to illustrate this by mentioning a few localities represented in the beautiful collection of *Ruppia* in the Rijksherbarium, Leiden, which were kindly put at our disposal by its Director. If we add to these a few localities cited from the literature we obtain the following picture. The plant occurs throughout Europe, North America, the West Indies, the Caribbean coasts, the Northern and Eastern coasts of Africa, British India, Java, Madoera, the Philippines, China, Japan, Korea, Australia and Tasmania.

From the preliminary experiments of SETCHELL (15) it seems to follow that *Ruppia* is unable to withstand extreme conditions of temperature and salinity: SETCHELL gives 15—20° C. for germination and seedling-development, 20—25° C. for vegetative growth and reproductive activity; salinity 0.68—4.59 %. It is obvious, however, that the range of salinity and of temperature for *Ruppia* is greater than these limits. One of us was able to observe the Ruppion near Setubal, Portugal; near Dadar, Bombay Presidency; on the island of Madoera, Dutch East Indies; and in the Bay of St. Vincent, Port Price, South Australia. In Portugal a large form (var. *longipes* HAGSTRÖM?) was observed early in September in water containing 7 % solids at a temperature of 28° C. A small variety corresponding to var. *rostellata* KOCH, was observed in fruit in the condensor ditches at Dadar (Bombay Presidency) during February 1936. Here the salinity varied between 7 and 11 %! In Madoera, the plants, corresponding to the var. *spiralis* KOCH were in apparently healthy condition, covering vast stretches of subaquatic meadow at a salinity of 6 % and at a temperature around 30° C. At the Ruppion of Pt. Price, South Australia, the salinity varied between 6—7 %!

The gypsum lakes of Yorke Peninsula when visited by one of us in March 1936, only contained saturated brine and salt-crusts. Still, LOCKHART JACK (8) mentions the occurrence of „salt-weed" in the wet season which disappears at higher concentration. The dried and salt-incrusted stalks, found by us at e.g. Fowler and Black-Hill lakes undoubtedly belonged to *Ruppia*!

From the above it appears that *Ruppia* is cosmopolitan, that its temperature-range extends well beyond 25° C. (where SETCHELL found, for the races studied by him, a deficient anthesis) and that, furthermore, the salinity tolerated might be higher than 10 % total salts. In these respects *Ruppia* appears to be unique; competition with other Phanerogams (even *Zostera*) is excluded and therefore it appears whereever this particular environmental „niche" is given on this planet. The faunistic elements of the *Ruppion* vary e.g. Molluscs: in S. Australia and Tasmania we find *Coxiella badgerensis* and *Hydrobia* spec.; from Ehrenberg's *Ruppia* material collected near El Tor, Red Sea in 1825 we extracted a shell of *Potamides* sp. while in Holland the Molluscs of the Ruppion are species of *Hydrobia* — *H. stagnalis* and *H. ulvae*; but the floristic elements seem to be more specific. These are *Enteromorpha* and *Chaetomorpha* from the greens, from the Diatoms e.g. *Amphora coffaeiformis* and *Navicula haliphila*, from the bluegreens two or three species of *Spirulina* and especially the mat-forming cosmopolitan *Microcoleus chthonoplastes* THUR. From our own collections as well as from the material of the Rijksherbarium, Leiden we obtained the following list of localities for the latter: Europe, North America, North and East coast of Africa, British India, Samoa, Dutch East Indies,* Australia. As other elements we may mention the curious *Eutreptia viridis* PERTY, var. *Schizochlora* ENTZ, found in Siebenburgen by ENTZ, and appearing again in California and Setubal!

The „Ruppion maritimae", while cosmopolitan and, as far as its floristic elements are concerned, rigidly specific still shows, in its faunistic components certain regional (i. e. non-cosmopolitan) traits. Apparently even at salinities of 10 % the milieu is not yet sufficiently specific to determine all components unambiguously.

A milieu both sufficiently extreme (exceeding the general potentialities of most organisms) and specific (exceeding the specific potentialities of most organisms) may be found in hot springs, in excessively alkaline or acid lakes and also in saturated brines. The second author has been carrying out a comprehensive study of these brines from various localities all over the world and from this study it

appears that this biocoenosis is identical whether the brines are studied in North America, South America, Australia, Asia or Europe. The characteristic organism here appears to be a green polyblepharid flagellate, *Dunaliella viridis* TEODORESCO and the community may be designated as a „Dunaliellon". Drawing only from personal experience, the occurrence of this community was observed in Argentine, Brazil, Venezuela, West Indies, California, Nevada, Utah, Portugal, Italy, Roumania, Hungary, Crimea, Palestine, Egypt, Tunis, Algiers, Djibouti, South Africa, Java, Madoera, Gobi-desert, Hawaii, South Australia, Victoria.

This Dunaliellon is further characterized by the occurrence of another polyblepharid flagellate, *Asteromonas gracilis* ARTARI (Crimea, Portugal, California, Brazil), by a bluegreen, *Aphanocapsa salina* FRÉMY and by a group of colourless flagellates, originally described by NAMYSLOWSKY (12) and ENTZ (4). Curious salt-loving bacteria (e. g *Micrococcus morrhuae* KLEBAHN) and Fungi (*Oospora halophila* v. BEYMA THOE KINGMA) occur also. The selective factor is, in this case, the salt-concentration.

When, for a certain organism other factors (alkalinity, ionic proportions, temperature) may be limiting but not NaCl-concentration as such, we observe, even in concentrated brines, a group of real „die-hards", the most eurytopic organisms but which, like Achilles, have their vulnerable spot — namely in the rare cases where the terrestrial milieu exceeds their potentialities. Having progressed, in the course of this discussion from the general to the specific we are faced, at this point with the most „general" organisms! *Polytoma uvella*, a colourless biflagellate occurs in freshwater and in salt, in cold water and in hot springs at 42° C. Species of *Amoeba* occur in concentrated brine, in freshwater and in saline hot springs. Bluegreens of the genus *Phormidium* perform the same feat, and also *purple* and *thiobacteria*. Special mention should be made here of the bacteria capable of decomposing cellulose and sulphate anaerobically, for there is no natural solution without them. A large number of *Ciliates* and *Flagellates* and even *Nematodes* and *Flies* are apparently equally unlimited in their potentialities and, therefore, in their distribution. Possibility of universal dispersal is a reality for the majority of living things.

In this case the selective milieu, picking out from the mass of latent life those that show „resonance", those that are awakened to active development, is all-important. From organisms with a more limited capacity for dispersal the milieu selects as well. The available mass of

organisms is herded into the various biocoenoses. Any new evolutionary unit, whether a mutation or a true-breeding hybrid is weighed by the environmental complex and is found fit or may be found wanting.

It has been most refreshing to us to consider convergence and identity in its relation to dispersal and external environment in this simple Darwinian way. While aware of many partly conflicting theories on this subject, we feel that in the main our trail has been that of the man who sailed in the „Beagle" more than a century ago.

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VELLOZIACEAE AMERICANAE NONNULLAE NOVAE VEL MINUS COGNITAE

auctore

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Barbacenia Blanchetii Goeth. et Henr. nov. spec. — Caudex brevissimus, simplex vel divisus, squamis adpressis dense tectus ad $1\frac{1}{2}$ cm crassus. Folia laete viridia, dense conferta, numerosa, exteriora saepius pauca reflexa, siccitate contorta, interiora gradatim magis erecta, omnia linearia, acuta, subulata, utrinque striatula, breviter sparse subadpresse pilosa, subtus in nervo mediano paullum prominente leviter carinata et in margine dense breviuscule pilosa, basin marginis versus longe albociliata, circ. 10—12 cm longa, 1 cm lata. Flores ad 1—3 per rosulam, subterminales, violacei. Scapus foliis fere duplo brevior, subtrigonus, dense pilosus, pilis longis tenuibus subflexuosis divergentibus. Perigonii tubus elongato-clavatus, multicostatus, 3—4 cm longus, fauce circ. 6 mm amplus, fere $\frac{1}{2}$ parte ovario vix incrassato, clavato vel clavato-oblongo, pilis longiusculis subadpressis glanduliferis densiuscule vestito, adnatus, superne breviter parce pilosus. Tepala erecta vel erecto-patentia, longitudine fere ovarii, lineari-lanceolata, circ. 2 cm longa, 4 mm lata; 3 exteriora paullum angustiora, acutiuscula, extus breviter pilosa; 3 interiora glabra, obtusa, breviter mucronulata. Stamina tepala fere aequantia. Filamenta subcoriacea, longa, linearia, apicem versus breviter bifida, gradatim attenuata, ad 14 mm longa, $2\frac{1}{2}$ mm lata, prope apicem antheram linearem, filamento aequilongam dorsifixam filamentum $\frac{3}{4}$ partibus superantem gerentia. Stylus filiformis, trigonus, parte stigmatifera fere globosa, paullum incrassata, tepala aequans. Capsula ellipsoidea, circ. 18-costata, breviuscule subadpresse pilosa.

Brasilia: prov. Bahia. leg. Blanchet. no. 3278! (Herb. Mus. Berol., Herb. Mus. Vindeb., Herb. Delessert); Blanchet 3273! „Igreja Velha" fl. violettes" (Hb. DC.); Blanchet 2537! La Jacobina (Hb. DC., Hb. Mus. Paris); 3870 — Ponço d'Areia (Herb. Mus. Paris, Herb. Delessert).

Imag. photogr. Herb. Lugd. Bat. no. 131, 132, 120.

Barbacenia brachycalyx GOETH. et HENR. nov. spec. — Stirps glaberrima. Caudex brevissimus, simplex, ad 2½ cm crassus, squamis erecto-patentibus, plus minusve fissis tectus. Folia subrosulata; interiora ad 6—8 erecta; exteriora numerosa, reflexa, mox marcescentia, persistentia; omnia lanceolata, subulato-acuminata, acumine complicato, ad 11 cm longa, 1 cm lata, plana tenera, glauca, subincrassato-marginata, nervo mediano subtus prominente, leviter carinata, in marginis carinaque parte superiore minute, inferne remotiuscule, apicem versus densissime serratim denticulata. Flores solitarii subterminales, rubro-purpurei. Scapus foliis sesquilongior, erectus, subflexuosus, striatus (trigonus?). Perigonii tubus totus fere ovario obsolete clavato circ. 18-costato, adnatus, fauce ampliatus, usque ad 10 mm longus, 3 mm crassus. Tepala ad 25 mm longa, erecta; 3 exteriora spathulato-oblonga, subunguiculata, breviter acuminata, parallelinervia, ad 6 mm lata; 3 interiora oblonga, ad 8 mm lata, obtusa, breviter mucronato-acuminata, margine lata oblique venosa. Filamenta subcoriacea, ad 11 mm longa, usque paullum supra medium in tubum cylindricum connata, partibus liberis late linearibus, apice rotundatis, prope apicem antheras lineares, circ. 10 mm longas fere basifixas gerentia. Stylus elongatus, filiformis, subtrigonus, tepala aequans vel paullum superans, parte stigmatifera incrassata ovoideo-trigona, stigmatibus oblongis. Capsula ignota.

Brasilia: prov. Goyaz. leg. GLAZIOU no. 22207. „Pichoa au Morro do Espigao, sur les rochers, 5 oct. 1894. Fleur rouge pourpre". Typus in H.L.B. sub no. 912.180—581.

Imago photogr.: Herb. Lugd. Bat. no. 138.

Barbacenia caricina GOETH. et HENR. nov. spec. — Caudices (e rhizomate oriundi?) numerosi, elongati, erecti vel adscendentes, simplices vel saepius furcati, graciles, usque ad 30 cm longi, 3 mm crassi, squamis arcte adpressis, sulcatis, ecarinatis quarum apices grisei, partes basales fusco-purpurascentes, tecti et fere omnino foliis emarcidis, refractis velati. Folia trifaria; superposita 5—10 mm distantia; juniora pauca erecta et erecto-patentia; adulta circ. 20, horizontalia; omnia anguste lineari-triangularia, 70—80 mm longa, 2½ mm lata, glabra, canaliculata, nervo mediano subtus prominente rotundato-carinata, carina praeter partem basalem aculeolis rarioribus, acutis, inferne saepe binatis scabra; margine densiuscule aculeolata, aculeolis inferne saepe binatis et recurvatis, apicem versus irregulariter serratim dispositis. Characteres florum imperfecte cogniti; (e flore unico emarcido). Ovarium costatum. Perigonii tubus supra ovarium paullum productus. Tepala lineari-lanceolata,

(erecto-patentia?), rubra (fide Binot). Stamina tepalis multo breviora. Filamenta late linearia, binervia, apice bifida, incisione angustissima, laciniis late rotundatis, toto filamento 4—5-plo brevioribus. Antherae filamenta aequantes, prope basin filamenti affixae. Stylus stamina circ. aequans, parte stigmatifera longissima ad basin modice incrassata, triquetra, apicem versus sensim attenuata. Capsula oblonga, trigona, 12-costata, 15 mm longa, 7 mm lata, item ac pedunculus validus, subterminalis, folia multo superans glaberrima.

Brasilia: Rio Janeiro: Glaziou no. 12222. „Nova Friburgo a la Pedra do Conego, le 23 Juin 1880." (sine fructificatione). Typus in H. L. B. sub no. 912.180—559. In specimine vivo a cl. Binot in Brasilia lecto et in hortum botanicum Lugduno-Batavum invecto, capsulas et flores emarcidos inspicere potui. Nomen inditum propter innovationes, Caricum complurium similis.

Imago photographica Herb. Lugd. Bat. no. 158.

Barbacenia conicostigma Goeth. et Henr. nov. spec. — Acaulis v. caulescens (fide Riedel). Folia lanceolata, exteriora probabiliter reflexa, in apicem filiformem angustata, glabra, striata, basi resinosa carina dorso rotundato, glabra, margine in tertia parte superiore breviter, in parte inferiore longe ciliata, pilis longioribus rigidiusculis flavo-fuscis erecto-patentibus, pilis brevioribus intermixtis. Rosulae in specimine unico viso 3-florae. Scapi folia superantes erecti dense glandulosi, pilis glanduliferis crassis patentibus, subtortuosis et pilis glanduliferis multo brevioribus, angustioribusque patentibus, rectis. Flores coccinei. Ovarium subtrigono-ellipsoideum dene glanduloso-pilosum, pili glandulosi patentissimi biformes, scilicet longiores robustiores subcurvati, pilis multo brevioribus rectis intermixtis. Perigonii tubus cylindricus, ovario parum angustior, pilis glanduliferis iis ovarii similibus, sparsis, praeditus, ovario 3-plo longior, limbus in laciniis sex lineari-lanceolatis, erecto-patentibus (post anthesin recurvatis?) tubo $^1/_3$ brevioribus divisus; laciniae 3 exteriores parum longiores, acutae, dorso densiuscule glandulosae; 3 interiores obtiusculae, breviter acuminatae, glabrae. Stamina filamentis deplanatis apice bifidis, laciniis erectis angustis acutissimis, filamento duplo brevioribus, fere in bifurcatione antheras gerentibus. Antherae lineares, tepalis fere aequantes, basin filamenti haud attingentes, apicem laciniarum ½ filamenti longitudine superantes, post anthesin extrorsum circinantes. Stylus apicem filamentorum laciniarum attingens, in parte superiore filamentorum longitudine parum incrassata, subuliformi, stigmata 3 lateralia, lineari-spathulata gerens.

Brasilia: Specimen unicum incompletum in Herb. Leningrad asservatur „Acaulis et caulescens. Flor. coccinei. In saxosis monti alti. Serra da Lapa". RIEDEL anno 1824.

Imago photogr.: Herb. Lugd. Bat. no. 115.

Barbacenia curviflora GOETH. et HENR. nov. spec. — Caudex brevis, erectus, ad 4—5 cm longus, circ. 1½ cm crassus. Folia numerosa, spiraliter conferta, erecta usque ad patentia; exteriora incurvata; omnia linearia, acuminata, striata, in sicco marginibus revolutis, usque ad 25 cm longa, 8 mm lata, in vaginam adpressam, amplectentem, stramineam, sulcatam, late membranaceo-marginatam dilatata; nervo mediano, subtus valde prominente, squamulis subadpressis, acutiusculis, basin versus saepius binatis, remotiusculis serrato, acute carinata; supra albicantia, resinosa, squamulis numerosis, latis, brevissimis, superne integris, basin versus denticulatis, ima basi in pilos deplanatos, acutos, subadpressos, excurrentibus transverse zonata et margine squamulato-serrata basin versus ciliata; subtus (in sicco) sordide fusco-viridia. Flores 2—3 subterminales, rubro-violacei. Scapi erecti vel flexuosi, foliis breviores, trigoni, sulcati, fere in tertia parte superiore pilis paleaceis, linearibus, longiusculis, rubescentibus, glandulis parvis terminatis densiuscule vestiti. Perigonii tubus elongatus, curvatus, costatus, cylindricus, apicem versus vix ampliatus, ad 4—5 cm longus, 3 mm amplus, fere tertia parte ovario clavato, leviter curvato, adnatus, cum tepalorum exteriorum dorso pilis deplanatis, glanduliferis, aeque ac in scapo occurentibus, supra ovarium sensim decrescentibus, densiuscule vestitus. Tepala erecta, lingulato-linearia, obtusa, mucronulata, circ. 20 mm longa, 2 mm lata. Stamina tepalis fere duplo breviora. Filamenta plana, e basi lata in apicem 1 mm latum, angustata, lateribus concavis, circ. 4 mm longa, apice incisione late triangulari bifida, laciniis brevibus obtiusculis. Antherae infra incisionem affixae, basin filamenti vix attingentes, apicem ¾ partibus excedentes, ad 13 mm longae. Stylus filiformis, tepala aequans vel paullum superans, parte stigmatifera modice incrassata, oblonga.

Brasilia: prov. Minas Geraes. GLAZIOU no. 19923. „Rio dos Pedros au Valu dans le terrain pierreux (Minas) 2 Mai. Fleurs rouge-violacées." (Herb. Mus. Bot. Berol.)

Imago photogr.: Herb. Lugd. Bat. no. 123.

Barbacenia cuspidata GOETH. et HENR. nov. spec. — Caudex brevis, crassus, bifurcatus, squamis griseo-fuscis, fissis, adpressis spiraliter dispositis dense vestitus. Folia numerosa, subrosulata, erecto et erecto-

patentia, nonnulla exteriora horizontalia, emarcida reflexa, caudice adpressa; omnia anguste linearia, longe cuspidata, apice filiformi, tenera, glabra, striatula, integra, basin versus anguste scarioso-marginata, 16 cm longa, 4 mm lata. Flores in apice ramorum solitarii, pseudoterminales. Pedunculi erecti, folia superantes, ad 20 cm longi, filiformes, subtrigoni, sulcati, densiuscule pilis longiusculis, patentibus, subflexuosis, in glandulas parvas terminatis, pilis multo minoribus intermixtis, obsiti. Perigonii tubus costatus, $^1/_5$—$^1/_4$ parte ovario oblongo adnatus, supra ovarium angustatus et deinde ampliatus, elongato-infundibuliformis, pilis glanduliferis, ut in scapo occurrent, in parte ovariali crebris, faucem versus rarioribus. Ovarium circ. 10 mm longum, 4—5 mm crassum; tubus perigonii circ. 45 mm longus, supra ovarium 2 mm, ad faucem 8 mm amplus. Tepala ovario sublongiora, late linearia circ. 12 mm longa, 4,5 mm lata, apice late rotundata, mucronulata, omnia aequilongia, parallelinervia; exteriora secus nervum medianum parce glanduloso-pilosa. Stamina $^2/_3$ tepalorum longa. Filamenta supra basin dilatatam angustata, deinde oblonga circ. 4,5 mm longa, usque a medio fere bifida, laciniis anguste triangularibus, acutis, subparallelis prope incisionem antheram 12 mm longam et basin et apicem filamenti longe excedentem gerentia. Stylus filiformis, parte stigmatifera oblongo-globosa, stamina vix superans. Cetera ignota.

Brasilia: probab. prov. Minas Geraes. Specimen unicum inter specimina B. longiflorae Mart. a cl. Glaziou sub no. 19927 lecta, inveni (Hb. Paris).

Imago photogr.: Herb. Lugd. Bat. no. 135.

Barbacenia flavida Goeth. et Henr. nov. spec. — Caudex brevissimus, erectus, circ. 5 cm longus, 1½ cm crassus, foliis emarcidis, reflexo-patentibus, numerosis velatus. Folia spiraliter disposita, conferta; viventia 6—8 erecta usque ad horizontalia; late linearia longe cuspidato-attenuata, nervo mediano subtus prominente tenuiter carinata, in sicco margine plus minusve revoluta, glabra, striata, viridi-flava, margine carinaque aculeolis remotis subadpressis praedita, mox glabrescentia, circ. 20 cm longa, 9—11 mm lata. Scapus solitarius, gracilior, erectus, flexuosus, apice curvatus, subtrigonus, striatus, superne parce verruculoso-scaber, infra florem obliquum v. horizontalem densiuscule breviter stipitato-glandulosus. Perigonii tubus cylindricus basi rotundatus, ad 15 mm longus, 4½ mm crassus; partibus 4 ovario 15—18-costato, in costis leviter verruculoso adnatus. Tepala circ. 20 mm longa, erecto-patentia; 3 exteriora lanceolata, acuta, submucronulata, parallelinervia, ad 5 mm lata; 3 inte-

riora oblonga ad 7—8 mm lata, obtusa, submucronulata, in parte marginali oblique venosa. Filamenta membranacea, e basi lata oblonga nervis duobus apice furcatis perducta, rotundato-truncata, ad 8 mm longa, 5 mm lata, apice bifida, incisione angustissima, laciniis circ. 2—2½ mm longis, leviter emarginatis, ima basi antheram fere basifixam, filamento aequilongam gerentia. Stylus trigonus ad 8 mm longus, incisionem filamentorum attingens; parte stigmatifera vix incrassata conico-triquetra, circ. 4—6 mm longa. Cetera ignota.

Brasilia: Prov. Minas Geraes. leg. A. DE ST. HILAIRE. Catal. D. N. 505. (Mus. Paris); Dep. Goyaz, Pichoa au Morro do Espigao. Sur les rochers. Fleurs rouges. 5 octobre 1894, leg. GLAZIOU no. 22207bis. Typus in H. L. B. sub no. 937.79—23.

Imago photogr. in Herb. Lugd. Bat. no. 139.

Barbacenia foliosa GOETH. et HENR. nov. spec. — Caudex subtrigonus, circ. 10 mm crassus, longitudine ignota. Folia trifaria, superposita, circ. 8 mm distantia, viventia pauca, erecto-patentia; emarcida numerosa, refracta, caudicem velantia, omnia linearia, apicem versus longe angustata, acutissima, usque ad 24 cm longa, 8 mm lata, plana vel leviter canaliculata, striata, glabra, nervo mediano subtus prominente anguste acutiuscule carinata, margine carinaque denticulis acutis, prorsum spectantibus, valde remotis, in foliis vetustioribus saepissime glabrescentibus; vaginae brunneae, sulcatae, arcte adpressae et resina propria conglutinatae. Scapus ad 15 cm longus, solitarius, subterminalis, (subtrigonus?), inferne glaber, superne glandulis nonnullis breviter stipitatis praeditus, apice densiuscule verrucoso-glandulosus. Tubus perigonii circ. 15 mm longus, 1 mm crassus, trigono-prismaticus, apice vix ampliatus, tribus partibus ovario adnatus, 12-costatus; costae 3 in aciebus ovarii remotiuscule stipitato-glandulosae; costae intermediae glabrae vel basin versus parce minuteque verrucosae. Tepala erecto-patentia, ovato-lanceolata, glabra; 3 exteriora longiora et angustiora, 25 mm longa, 4—5 mm lata, longe acuminata, parallelinervia, nervo mediano valido perducta; 3 interiora, 20 mm longa, circ. 7 mm lata, acutiuscula, margine angusta oblique-venosa. Filamenta late linearia, binervia, apice bifida, laciniis brevibus, rotundatis, 7—8 mm longa, 2½ mm lata, 3 exteriora paullo longiora, prope basin antheram fere basifixam, filamento 1¼-plo longiorem gerentia. Stylus stamina aequans, parte stigmatifera vix incrassata, subulata, stigmata (infra apicem oblonga?) ferens. Capsula ignota.

Descriptio e specimine unico in Herb. Mus. Bot. Berol. asservato.

Brasilia: Rio de Janeiro: E. Ule Herb. Brasil. no. 4056. „An Felsen der Tijuca, Rio de Janeiro. November 1894".

Observ. A. *B. squamata,* Hook.fil. diversa: caudice dense foliato, forma ovarii tepalorumque, filamentis multo longioribus.

Imago photogr.: Herb. Lugd. Bat. no. 153.

Barbacenia fragrans Goeth. et Henr. nov. spec. — Caudex usque ad 50 cm longus, 1—2 cm crassus, erectus vel curvatus, dichotomus, rudimentis foliorum obliteratorum totus tectus. Folia spiraliter disposita, remotiuscula, numerosa, viventia erecta usque ad patentia, inferiora magis, superiora minus curvata; emarcida reflexa, omnia linearia, longe acuminata, plana, striata, tenuiter carinata, utrinque densiuscule breviter glanduloso-pilosa vel fere glabra, margine carinaque densius pilosa, 14—30 cm longa, 7—13 mm lata. Scapi 1—2, subterminales, graciles, teretiusculi, pilis breviusculis tenuibus, hyalinis in glandulas parvas terminatis vestiti. Perigonii tubus trigono-cylindricus, sordide rubescens, in sicco 4 cm longus, 5 mm latus, sec. cl. Mosèn in vivo 7—8 mm latus, ½ parte inferiora modice inflatus, evidenter costatus, densiuscule breviter glanduloso-pilosus, ovarium plus quam duplo longior. Tepala in anthesi erecto-patentia, lanceolata, acutiuscula, basin versus paullum angustata, 3—3½ cm longa, circ. 7 mm lata, parallelinervia nervo mediano extus prominente; 3 exteriora nervo mediano porrecto breviter mucronulata, extus breviter glanduloso-pilosa; 3 interiora fere glabra; omnia intus glabra, purpurascentia. Glandulae perigonii odorem Pelargoniorum exhalent. Filamenta linearia circ. 6 mm longa, 1 mm lata, basin versus paullum dilatata, apice in lacinias duas, breves, obtusas, fissa, prope apicem antheram dorsifixam, medium filamenti fere attingentem, apicem plus quam duplo superantem circ. 12 mm longam, gerentia. Stylus filiformis, parte stigmatifera incrassata, ovoidea, stamina superans. Cetera ignota. Characteres essentiales plurimi a cl. Mosèn e vivo observati in schedula plantae ab illo lectae optime indicati sunt.

Brasilia: prov. Minas Geraes et S. Paulo. Hj. Mosèn. Herb. Brasil. Regnelli no. 4444 (typus); „Caldas, supra rupes apricas interdum madidas in fissuris rupium" 1 fevr. 1876. Widgren sine no. in Herb. Brasil. Regnell. Mus. bot. Stockholm. no. III 1239; Caldas inter Gerivas et Engenho de Serra inter Saxa. leg. A. F. Regnell; Commissao geogr. e geolog. de S. Paulo, no. 2198. Fazenda Santa Cecilia S. J. da Boa Vista. Typus in Mus. Bot. Stockholm.

Imago photogr.: Herb. Lugd. Bat. no. 133.

Barbacenia fulva Goeth. et Henr. nov. spec. — Caudex (versimiliter brevis) subincrassatus, foliis emarcidis reflexis velatus. Folia numerosa

(ad 12), conferta, erecta et erecto-patentia, emarcescentia reflexa; omnia linearia, a medio fere sensim angustata, cuspidata, striata, glabra, in margine et in carina modice prominente rotundata, breviter denseque ciliata, circ. 35 cm longa, 7—8 mm lata. Flos solitarius. Scapus foliis multo brevior, validus, trigonus, sulcatus, dense fulvo-hirtus, pilis patentibus, subuliformibus, subtortuosis; inferne breviter, superne gradatim longiter pilosus. Perigonii tubus coriaceus fere cylindricus, circ. 25 mm longus, basi rotundato-attenuatus, apicem versus vix ampliatus, circ. ¾ partibus ovario adnatus, totus pilis aeque ac in scapo occurrunt sed longioribus subadpressisque vestitus. Tepala erecto-patentia, tubo fere duplo longiora, lanceolata; 3 exteriora subangustiora, acuta, nervo mediano crasso, prominente excurrente, breviter mucronulata, dorso praecipue basin versus et in mediana parte longe subadpresse fulvo-pilosa; 3 interiora apice obtusa vel rotundata nervo mediano haud incrassato, in dorso basin tantum pilosa. Stamina tepalis fere duplo breviora. Filamenta lineari-spathulata, 25 mm longa, acuta, bifida, incissione lineari, laciniis acutis filamento circ. 4-plo brevioribus, antheram fere aequilongam, bifurcationem attingentem imae basi gerentia. Stylus crassiusculus, apicem filamentorum fere attingens in ½ parte superiore modice incrassata, elongato-conica, stigmatifera. Capsula immatura late oblonga, dense longeque fulvo-pilosa rudimentis tepalorum coronata.

Brasilia: prov. Minas Geraes, St. Hilaire, Catal. C[1] no. 362 (Herb. Mus. Paris).

Imago photogr.: Herb. Lugd. Bat. no. 122.

Barbacenia gaveensis Goeth. et Henr. nov. spec. — Caudex erectus, elongatus, circ. 5 mm crassus, plus quam 15 cm longus. Folia trifaria, superposita ad 7 mm distantia; juniora pauca erecta; adulta circ. 6 horizontalia mox plus minusve reflexa; emarcida numerosa, reflexa; omnia anguste linearia, cuspidata, usque ad 22 cm longa, 5 mm lata, plana vel subcanaliculata, striata, nervo mediano subtus prominente angusto, rotundato, carinata, margine carinaque denticulis acutissimis, subadpressis remotis serrata, vaginis dilatatis, amplectentibus, rotundatis, sulcatis, opacis, brunneo-fuscis, vetustioribus laceratis. Flores subterminales, solitarii (rubri?). Scapus tenuior, obsolete trigonus, praeter glandulas paucas breviter stipitatas infra florem, glaber, circ. 15 cm longus, folia superans. Perigonii tubus clavatus (subtrigonus?) circ. 18 mm longus, apice 6 mm amplus ,tribus partibus ovario adnatus, irregulariter, circ. 12-costatus; costae 6 in tepalorum mediano se continuantur aculeolis brevibus obtusis, remotis, notatae; costae intermediae glabrae vel basin

versus minute verruculosae. Tepala erecto-patentia, circ. 5 mm lata, (apices tepalorum omnium in specimine unico a me viso defracti) (oblongo-lanceolata?). Filamenta obovato-linearia, binervia, circ. 8—9 mm longa, 2½ mm lata, apice profunde bifida, laciniis parallelis, lanceolatis, apice obtiusculis vel rotundatis, 2½ mm longis, ima basi antheram, fere basifixam, incisionem attingentem ferentia. Stylus medias antheras superans; parte sigmatifera vix incrassata, conica, circ. 2½ mm longa, stigmatibus lineari-oblongis. Cetera ignota.

Brasilia: in cacumine montis. „Gavea" dicta ubi leg. cl. GLAZIOU 29 junio 1875 (sine numero).

Imago photogr.: Herb. Lugd. Bat. no. 152.

Barbacenia gentianoides GOETH. et HENR. nov. spec. — Caudex brevis vel brevissimus, interdum adscendens, simplex vel furcatus, squamis griseo-brunneis, plus minusve fissis, arcte adpressis, dense tectus. Folia rosulata, numerosa; juniora erecta cetera reflexo-patentia; dein marcescentia, lineari-lanceolata, acuminata, nervo mediano subtus paullum prominente tenuiter carinata, rigida, plana, striata, acumine complicato, pungentia 3—8 cm longa, circ. 5 mm lata, subtus plus minusve dense adpresse albo-pubescentia, supra glandulis sessilibus vel brevissime stipitatis, hyalinis, densiuscule vestita, margine superne pilis brevibus hyalinis in glandulas parvas terminatis, basin versus pilis longis, albidis, subulatis ciliata. Flores 1—2 per rosulam, ignei, sessiles, folia superantes. Perigonii tubus longe cylindricus, faucem versus ampliatus, circ. $^1/_5$ parte ovario ovoideo, subtrigono obsoletius costato adnatus, breviter densiuscule fulvo-pilosus vel interdum fere glaber. Tepala aequilonga, tubo breviora, linearia, apice breviter acuminata mucronulata, parallelinervia, ad 24 mm longa, 4 mm lata, juniora saepe canaliculata, erecta, deinde erecto-patentia et patentia. Filamenta hyalina, membranacea, 3 exteriora paullo breviora usque ad $^2/_3$ partes in tubum cylindricum connata, dein apicem versus leviter emarginatum angustata, laciniis brevissimis acutis, nervo mediano crasso, saepe nervis 3—4 confertis formato, hinc illinc nervos paucos laterales oblique emittente, perducta; prope apicem antheras lineares fere basifixas circ. 10 mm longas, post anthesin plus minusve recurvatas, gerentia. Stylus filiformis subflexuosus, stamina longe superans, parte stigmatifera ovoidea, modice incrassata.

Brasilia: prov. Minas Geraes. GLAZIOU no. 19922—: Rio dos Pedros au Valu, 2 Mai 1892. Fleurs rouges-pourpres. Typus in H. L. B. sub no. 812. 180—582; RIEDEL no. 1422. Serra da Lapa in fiss. rupium; ST. HILAIRE

Catal. B [2] no. 2164 (Herb. Mus. Paris); SCHWACKE no. 8351— Zwischen As Dattas und Parauna auf Felsen. 19 avril 1892.

Imag. photogr.: Herb. Lugd. Bat. no. 144 et 145.

Barbacenia glabra GOETH. et HENR. nov .spec. — Tota planta glaberrima. Caudex brevis, simplex, ad 2 cm crassus, basibus foliorum emortuorum, irregulariter fissis, subopacis, fumigatis, densissime vestitus. Folia spiraliter disposita ad 12 subrosulata; interiora erecta; cetera patentia usque ad horizontalia, in parte superiore incurvata; omnia anguste linearia, subulato-acuminata, ad 28 cm longa, 4 mm lata, striata, nervo medio subtus prominente acute carinata, marginibus (in sicco) revolutis, basin versus anguste membranaceis, item ac carina denticulis brevibus acutis subadpressis remotis, praeditis; paullatim in vaginas amplectentes late ovatas, adpressas, fumigatas, sulcatas, subnitentes dilatata. Scapus solitarius subterminalis, teretiusculus, 15 cm longus foliis brevior. Perigonii tubus elongato-cylindricus, 40 mm longus, 3 mm crassus, 24-costulatus, tertia parte ovario elongato-clavato 13 mm longo adnatus. Limbus cupuliformis; tepala 15 mm longa; 3 exteriora ovato-lanceolata acuta mucronata, 3—4 mm lata parallelinervia; 3 interiora ovata 7—8 mm lata acutiuscula, mucronulata oblique nervosa. Filamenta linearia, 6 mm longa, 1 mm lata, hyalina, apice bifida; incisione angusti, laciniis acutis, parallelis, filamento triplo brevioribus; prope basin antheram dorsifixam, apice acuto, incisionem vix attingentem, basi rotundata ultra filamenti basin ad 2 mm porrectam, gerentia. Stylus filiformis, filamenta aequans, parte stigmatifera vix incrassata, trigona fere longitudine filamentorum, stigmatibus linearibus. Capsula ignota.

Brasilia: Minas Geraes, leg. A. DE ST. HILAIRE. Catal. C [1] no. 352 in Herb. Mus. Paris.

Imago photogr.: Herb. Lugd. Bat. no. 137.

Barbacenia Glaziovii GOETH. et HENR. nov. spec. — Caudex ignotus, probabiliter brevis. Folia ad 6 subrosulata, erecta et erecto-patentia, leviter incurvata, emarcida reflexa; linearia, longe cuspidata, plana, tenera, striata, utrinque subadpresse breviter pilosa, margine integra pilis albidis longioribus remotis erecto-patentibus, in glandulas parvas oblongas abeuntibus subciliata; nervo mediano subtus paullum prominente anguste carinata, circ. 25 cm longa, 6 mm lata. Flores ad 3 per rosulam, rubri. Scapi foliis multo longiores, erecti, flexuosi, trigoni, inferne fere glabri, a medio pilis longioribus majoribus et minoribus glanduliferis, patentibus, remotiusculis obsiti, circ. 33 cm longi. Ovarium

obovato-oblongum, subtrigonum, pilis crassis brevibus in glandulas majores abeuntibus, remotis, intermixtis pilis glanduliferis minoribus tenuioribusque vestitum, circ. 12 mm longum, 4 mm crassum. Perigonii tubus elongatus, $\frac{1}{4}$ parte ovario adnatus; supra ovarium angustatus, cylindricus, prope faucem ampliatus, inferne $2\frac{1}{2}$ mm, fauce 7 mm amplus, breviter parce glanduloso-pilosus, circ. 50 mm longus. Tepala erecta; 3 exteriora longiora, angustioraque, lanceolata, acuminata, ipso apice anguste rotundata, circ. 23 mm longa, 5 mm lata, obsolete nervosa, extus parce brevissime glandulosa; 3 interiora late oblonga, obtusa, parallelinervia, circ. 19 mm longa, 8 mm lata, glabra. Stamina tepalis exterioribus fere duplo breviora. Filamenta e basi dilatata sensim angustata circ. 8 mm longa, usque ad $^{1}/_{3}$ bifida, laciniis parallelis angustis, obtusis, prope bifurcationem antherum circ. 12 mm longam gerentia, cujus basis basin filamenti fere attingit, cujus apex apicem filamenti 5 mm superat. Stylus filiformis, parte stigmatifera paullum incrassata, obovato-oblonga, apicem antherarum vix attingens.

Brasilia: prov. Minas Geraes. Glaziou no. 19930. „Birybiry près de Diamantina, entre les pierres, 23 Mars 1892. Fleurs rouges". Typus in H. L. B. 912.180—578.

Imago photogr.: Herb. Lugd. Bat. no. 134.

Barbacenia globata Goeth. et Henr. nov. spec. — Caudex brevis, crassus, furcatus, foliis numerosis emarcidis reflexis, caudice arcte adpressis tectus, ob eam rem globatus, circ. 6 cm longus et crassus. Folia rosulata erecta, serius horizontalia et reflexa, linearia, breviuscule cuspidata, 7—8 cm longa, 5 mm lata, plana, nervo mediano subtus paullum prominente anguste carinata, utrinque brevissime subadpresse pilosa, margine integra, basin versus longe ciliata. Flores parvi lutei ad 3 per rosulam. Scapi erecti pseudoterminales, foliis breviores, filiformes, glandulis breviter stipitatis, superne in glandulas longius stipitatas ovarii transeuntibus. Perigonii tubus cylindricus, brevis, circ. 12 mm longus, 5 mm amplus, $\frac{1}{2}$ parte ovario adnatus, glandulis tenuiter stipitatis, pilis glanduliferis minoribus intermixtis, in ovario numerosioribus, densiuscule obsitus. Tepala erecta, tubo 3-plo breviora, a basi lata angustata, apice latiuscule rotundato inflexo; 3 exteriora toto dorso, 3 interiora secus nervum medianum tantum pilis glanduliferis praedita. Filamenta membranacea, trapezoidea, 2 mm longa, basi 1.6 mm, apice 0.5 mm lata, fere usque medium bifida, laciniis triangularibus acutis, prope bifurcationem antheram circ. 3.5 mm longam, apicem et basin filamenti excedentem gerentia. Stylus filiformis, parte stigmatifera vix incrassata fere globosa, insertionem antherarum attingens.

Brasilia: prov. Minas Geraes, SCHWACKE no. 8359 (Herb. Berol.) „Bl. gelb. Min. Ger.. Auf Felsen in den Bergen beim Rio dos Pedros, 28 avril 1892".

Imag. photogr.: Herb. Lugd. Bat. no. 110.

Barbacenia glutinosa GOETH. et HENR. nov. spec. — Acaulis. Folia pauca (4—7) subrosulata, erecto-patentia, exteriora siccitate saepe contorta, late lanceolata, breviuscule acuminata, plana, densissime glutinoso-tomentosa, pilis in glandulam minutam abeuntibus. Flores 1—2 pseudo-terminales, coccinei. Scapi foliis breviores vel subbreviores, erecti, pilis longis, in glandulam parvam abeuntibus, flexuosis, patentibus, rufescentibus dense vestiti. Perigonii tubus urceolatus, ad 10—15 mm longus, plus quam ½ parte ovario subtrigono adnatus, pilis ut in scapo occurent, apicem versus sensim decrescentibus, densissime vestitus. Tepala erecta, triangularia, apice rotundata, ad 7 mm longa, 3—4 mm lata, dorso longiuscule dense glanduloso, pilosa, fauce fere claudentia. Filamenta hyalina, late linearia, usque ad basin fere bifida, laciniis parallelis, acutiusculis, venis medianis ex insertione antherae prope filamenti basin oriundis, perducta. Anthera longitudine filamenti, medio dorso affixa. Stylus parte stigmatifera paullum incrassata breviuscule conica, basin antherarum attingens.

Brasilia: Prov. Minas Geraes. RIEDEL no. 1060. „Barb. acaulis, glutinosa, cor. subclausa, fl. coccineis. Arenos. M. da Lapa, nov. dec. 1824". Typus in H. L. B. sub no. 937.47—337.

Imago photogr.: H. L. B. no. 127.

Barbacenia Goethartii HENRARD nov. spec. — Caudex erectus, brevissimus, incrassatus, usque ad 3 cm longus, 1 cm crassus. Folia spiraliter disposita, subrosulata, horizontalia, leviter incurvata, lineari-triangularia, subulato-acuminata, acumine in foliis vetustioribus circinnatim recurvato, ad 7 cm longa, 4—5 mm lata, striata, subcanaliculata, nervo mediano prominente, subtus tenuiter carinata, supra glabra, subtus, praesertim apicem versus denticulis brevissimis deplanatis, acutis, sparsis, scabriuscula, margine carinaque denticulis vel squamulis denticulatis, cuspidatis minute ciliato-serrata. Flores parvi, ad 1—3 per rosulam, subterminales. Scapus brevis, ad 1 cm longus, breviter glanduloso-scaber, teretiusculus. Tubus perigonii cylindricus, basin versus paullatim angustatus, ad 2 cm longus plus quam dimidia parte ovario adnatus, circ. 18-costatus, costis breviter remotiuscule glanduloso-pilosis. Tepala erecto-patentia ad 8 mm longa, 3 exteriora angusta, lanceolata, acuminata, parallelinervia, ad

2½ mm lata, extus breviter sparseque glanduloso-pilosa; 3 interiora oblonga obtusa, submucronulata, oblique venosa, ad 4—5 mm lata, extus glabra. Filamenta late linearia, apice rotundata circ. 5 mm longa, 1½ mm lata, membranacea, punctata, binervia, incisione angustissima dimidium filamentum haud attingente bifida, laciniis lanceolatis, acutis. Anthera ima basi filamenti dorsifixa, tertia fere parte longitudinis filamenti excedens, incisionem vix attingens. Stylus filiformis, filamenta superans, parte stigmatifera incrassata, ovoidea. Capsula immatura ellipsoideo-trigona, supra basin constricta, evidenter 12-costata, costis remotiuscule stipitato-glandulosis, parte libera perigonii emarcidi striati, coronata.

Brasilia: prov. Minas Geraes (ad Penha?), ubi leg. St. Hilaire sine no. (Hb. Paris sub nomine *Barb. minuta, non B. minuta* Dinter).

Imago photogr.: Herb. Lugd. Bat. no. 136.

Barbacenia Hilairei Goeth. et Henr. nov. spec. — Caudex brevis, foliis reflexis numerosis apice contortis velatus. Folia spiraliter conferta, numerosa; interiora circ. 9, canaliculata, patentia, cetera numerosa plana, reflexa, apice contorta, omnia linearia, circ. 10 cm longa, 7 mm lata, acutissima, striata, nervo mediano tenui, subtus vix prominente, breviter subadpresse pubescens, margine dense, superne breviter, basin versus longe ciliata. Scapi plures, filiformes, folius fere duplo breviores, pilis tenuibus, breviusculis, patentibus, subtortuosis, densiuscule obsiti. Perigonii tubus cylindricus, ad 5 cm longus, 4—5 mm crassus, faucem versus sensim paullum ampliatus, curvatus, costatus, superne fere glaber, basin versus et in $^1/_5$ parte ovario clavato adnatus, densiuscule pilosus, pilis longiusculis subulatis, flexuosis divergentibus, apicem versus gradatim brevioribus. Tepala tubo triplo breviora, patentia, linearia, obtusa, mucronulata, parallelinervia; 3 exteriora dorso breviter pilosa, circ. 14 mm longa, 3 mm lata. Filamenta linearia, circ. 5½ mm longa, apice incisione triangulari breviter bifida, laciniis acutis, parallelis, infra incisionem antheram linearem, dorsifixam, basin filamenti attingentem, apicem duplo superantem gerentia. Stylus filiformis, parte stigmatifera ellipsoidea, stamina aequans. Capsula breviter ellipsoidea, circ. 12 mm longa, 9 mm lata, costis circ. 18, filiformibus, breviter densiuscule pilosis perducta, inter costas glabra, tubo emarcido coronata.

Brasilia: prov. Minas Geraes. A. de St. Hilaire, Catal. B [1] no. 635. (Herb. Mus. Paris).

Imago photogr.: Herb. Lugd. Bat. no. 119.

Barbacenia hirtiflora Goeth. et Henr. nov. spec. — Caudex ignotus.

Folia ad 10, subrosulata, erecta, serius patentia et plus minus reflexa, linearia, longe acuminata, cuspidata, plana, striata, glabra (glauca?) anguste carinata, margine carinaque pilis longis deplanatis angustissimis erecto-patentibus, fusco-atris ciliata, usque ad 20 cm longa, 10 mm lata. Flores ad 1—3 pseudoterminales, saturate lilacini. Scapi foliis sublongiores, validi, erecti, plus minusve flexuosi, subtrigoni, sulcati, inferne parce, apicem versus sensim densius et mox densissime pilosi, pilis longis, patentibus, tortuosis, atro-rufescentibus, subuliformibus, eglandulosis (v. glandulis minutissimis praeditis?) vestiti. Perigonii tubus urceolatus, saepissime paullum supra medium angustatus, apicem versus denuo ampliatus, fere ½ parte ovario adnatus, pilis ut in scapo occurrent, in glandulam minutam abeuntibus densissime vestitus, usque ad 25 mm longus, 8 mm latus. Tepala erecta, tubo fere 2-plo breviora, elongato-triangularia, apice rotundata; 3 exteriora, dorso dense longiuscule glanduloso-pilosa; 3 interiora apice obtusa submucronulata, glabra. Filamenta hyalina, linearia vel in parte superiore oblonga usque ad medium bifida, laciniis subparallelis acutis, cuspidatis, circ. 6—7 mm longa, antheram dorsifixam, circ. 10 mm longam filamenti apicem plus quam basin excedentem infra medium gerentia. Stylus filiformis, apicem filamentorum vix attingens, parte stigmatifera paullum incrassata, elongato-conica.

Brasilia: prov. Minas Geraes; Glaziou no. 19927a „Diamantina au Curalhino, sur les rochers, 14 avril 1892. Fleurs lilas foncé. Typus in Herb. Berol.

Imago photogr.: Herb. Lugd. Bat. no. 126.

Barbacenia inclinata Goethi. et Henr. nov. spec. — Caudex brevissimus, erectus, ad 1½ cm crassus. Folia dense spiraliter disposita; 4—5 interiora erecta, angustoria et multo breviora, quorum intima pedunculum cinguntur; adulta circ. 6, patentia, horizontalia, plana subcanaliculata late linearia, in acumen breviusculum, complicatum, recurvatum angustata, circ. 7—14 cm longa, 12—18 mm lata, acumine 15—25 mm longo, striata, marginata, nervo mediano subtus prominente anguste carinata, margine carinaque denticulata; denticuli apicem versus et praesertim in foliis junioribus crebri, longiores, patentes, serraturiformes, apicibus saepe recurvatis; basin versus gradatim rariores minoresque; marginales multo breviores in series transversales ordinati vel in squamulas dentatas coaliti. Flores subterminales, majores, nutantes vel horizontales, rubri. Pedunculus validiusculus, 14—20 cm longus, folia longe superans, subflexuosus, erectus, trigonus, striatus, basi glaber, ceterum glandulis parvis, stipitatis, remotis, apicem versus numerosioribus et

paullo majoribus scabriusculus. Perigonii tubus circ. 20 mm longus, clavatus, vel supra ovarium fere duplo brevius, 5 mm crassus, constrictus, deinde campanulato-ampliatus, 12-costatus; costae glandulis parvis stipitatis remotiusculis in parte libera tubi rarioribus praeditae. Tepala erecta, ad 30 mm longa, lanceolata, parallelinervia; 3 exteriora ad 5 mm lata, acuta, extus breviter glandulosa; 3 interiora ad 7 mm lata, acutiuscula in nervo mediano tantum glandulosa. Stamina tepalis paullo breviora. Filamenta ad 22 mm longa, membranacea, petaloidea, longe unguiculata, limbo obcordato, circ. 7 mm longo, 6 mm lato, ungue circ. 15 mm longo, basin versus sensim paullo angustato; nervo mediano crasso cujus apex in parte basali limbi truncatus, in apice et in parte inferiore limbi venas binas erecto-patentes, prope marginem bi- vel trifurcatas emittente, perducta. Antherae haud procul a basi in apice nervi mediani filamenti dorsifixae, circ. 1 cm longae, $^2/_5$ partibus filamentum excedentes. Stylus filiformis. longus, curvatus, stamina vix superans, parte stigmatifera paullum incrassata, oblongo-cylindrica ad 3 mm longa. Capsula ignota.

Brasilia: Prov. Minas Geraes, Glaziou no. 19921 „Serra dos Crystaes près Diamantina sur les rochers (Minas) 4 avril 1892. Fleurs rouges". Typus in H. L. B. sub no. 912.180—583.; Schwacke no. 8358, Birybiry bei Diamantina, auf Felsen, 24 mars. 1892.

Imag. phòtogr.: Herb. Lugd. Bat. no. 150 et 176.

Barbacenia itabirensis Goeth. et Henr. nov. spec. — Caudex brevis, crassiusculus, squamis, arcte adpressis, in fibris solutis, resina propria conglutinatis, junioribus in parte basali recurvatis, foliorum delapsorum praeditis, tectus. Folia ad 8 rosulata, glaucescentia, interiora erecta, exteriora horizontalia et reflexa; omnia e basi lata, membranaceo-marginata, linearia, a medio fere triangularia, in apicem brevem filiformem angustata, striata, anguste leviter carinata, margine carinaque pilis remotis subadpressis, subuliformibus, basi incrassatis, praedita, cetera glabra, ad 40 cm longa 8—10 mm lata. Flores lutei (solitarii?). Scapus trigonus, striatus, foliis subbrevior, superne pilis glanduliferis numerosioribus, breviusculis, infra medium gradatim minoribus rarioribusque, basin versus glaber. Ovarium obovato-clavatum, subtrigonum, glandulis breviuscule stipitatis dense vestitum. Perigonii tubus supra ovarium paullum constrictus, deinde campanulato-ampliatus, ½ parte ovario adnatus, in parte libera glandulis stipitatis quam in ovario paullo rarioribus praeditus, in alabastro circ. 25 mm longus, 6 mm amplus. Flores maturi non vidi. Tepala erecta, parallelinervia; exteriora fere triangularia, circ. 17 mm longa, basi 5 mm lata, apice anguste rotundata, dorso densiuscule

stipitato-glandulosa; interiora paullo breviora et latiora acuminata, glabra. Stamina (ab insertione filamenti usque ad apicem antherae) circ. 13 mm longa. Filamenta late linearia ad 7½ mm longa, usque a medio fere bifida, laciniis fere parallelis, anguste triangularibus obtusiusculis, prope bifurcationem antheram 15 mm longam gerentia, cujus basin filamentum paullum, cujus apex filamentum longe superat. Stylus filiformis, filamenti apicem vix superans, parte stigmatifera quam stylo duplo crassiore, lineari-oblonga. Species imperfecte cognita!

Brasilia: prov. Minas Geraes; GLAZIOU no. 17827 „Pico d'Itabira do Campo, entre les pierres (Minas) le 20 dec. 1888. Fleurs jaunes" (Herb. Berl.; Herb. propr. cl. Glaziovii).

Barbacenia lilacina GOETH. et HENR. nov. spec. — Caudex ignotus, probabiliter brevis. Folia conferta, numerosa, ad 12, erecta et erecto-patentia, exteriora (pauca) horizontalia vel plus minusve reflexa, linearia, saepe plus minusve curvata, longe acuminata, utrinque pilis deplanatis anguste lanceolato-linearibus, acutis, subadpressis, hirsuta, plana, vel interdum complicata, striata, nervo mediano subtus altius prominente anguste carinata, margine integra, pilis longioribus ciliata, vaginis arcte adpressis, resina propria, conglutinatis. Flores lilacina 1—2 per rosulam. Scapus foliis subbrevior vel (saepius) longior, subtrigonus, sulcatus, glandulis gracilibus stipatitis dense vestitus. Perigonii tubus breviuscule cylindricus, basi rotundatus, ad 20 mm longus, 7 mm amplus plus quam ½ parte ovario obsolete trigono adnatus, glandulis stipitatis densissime vestitus. Tepala longitudine partis liberae tubi, primum erecta, deinde horizontalia, recurvata, circ. 12 mm longa, 4—5 mm lata; 3 exteriora e basi sensim attenuata apice rotundata, dorso densissime stipitato-glandulosa; 3 interiora linearia, apice late rotundata, mucronulata, extus mediano serie glandulorum minorum notata. Stamina tepalis breviora. Filamenta oblongo-lanceolata, basi dilatata usque ad $^1/_3$ vel $^1/_2$ bifida, incisione lineari, laciniis acutis, in medio fere vel inferius antheram, basin et apicem filamenti aequantem, gerentia. Stylus incisionem filamentorum vix attingens, parte stigmatifera paullum incrassata, elongato-conica.

Brasilia: prov. Minas Geraes, leg. GLAZIOU no. 19926. Serra do Funil au Rio Paranaha sur les rochers, 20 avril 1892. Fleurs lilas foncé. Typus in H. L. B. sub no. 912.180—527.

Fortasse formae duae distinguendae sunt, quarum una, var. **pallidiflora** HENR. nov. var. (Glaziou no. 19925 Curalhino près Diamantina, dans le campo, 14 avril 1892. Fleurs lilas) foliis pilosioribus, filamentis profundius bifidis, antheris in medio filamento fere prope bifurca-

tionem insertis, floribus pallidioribus et caudice incrassato a typo differt.

Imago photogr.: H. L. B. no. 128 et 129.

Barbacenia longiscapa Goeth. et Henr. nov. spec. — Caudex brevissimus, usque ad 7 cm longus et 1½ cm crassus, basibus foliorum vestustorum pallide-brunneis, tenuibus, striatis, tectus. Folia ad 8—15 dense spiraliter disposita (praeter pauca interiora erecta) patentia vel reflexa, linearia, longe acuminata, recurvata, 10—23 cm longa, 10—17 mm lata, canaliculata vel complicata, rigida, striata, nervo mediano subtus valde prominulo, carinata, margine carinaque serrulato-denticulata, denticuli magni acuti, apicibus leviter recurvatis, marginales inferiores saepe transverse dilatati, bicuspidati vel binati. Flores solitarii, rubri inclinati. Scapus elongatus, erectus, flexuosus, usque ad 35 cm longus, validus, trigonus, costatus, glandulis parvis brevissime stipitatis, apicem versus paullo majoribus rarioribusque scaber. Tubus perigonii circ. 18 mm longus, ovario oblongo circ. 18-costato, in costis tuberculato-glanduloso, adnatus, faucem versus abrupte ampliatus. Tepala erecta, post anthesin plus minusve patentia, tubo plus quam sesquilongiora, circ. 30 mm longa; 3 exteriora lanceolato-linearia, acuta, circ. 3—4 mm lata, parallelinervia, extus secundum nervos, glandulis punctiformibus scabra; 3 interiora lanceolata, 7—8 mm lata, acutiuscula, nervis parallelis, venis transversis, validis conjunctis perducta, extus in nervo mediano tantum scabra. Filamenta membranacea, hyalina, spathulata, quasi unguiculata, circ. 18 mm longa, apice bifida, laciniis leviter divergentibus latis, rotundatis 3—4 mm longis, 2½ mm latis, venis 3—4 ex apice nervi mediani crassi, prope incisionem abrupte truncati oriundis perducta. Antherae lineares, in dorso prope basin apici nervi mediani filamenti affixae, circ. 10 mm longae, lacinias ad 6 mm superantes. Stylus filiformis, elongatus in anthesi e flore exsertus, parte stigmatifera modice incrassata, obovato-oblonga. Capsula ignota.

Brasilia: Riedel no. 1062. In humid. rup. S. da Lapa. Dec. 1824. Typus in H. L. B. sub no. 937.47—336.

Imag. photogr.: Herb. Lugd. Bat. no. 140, 177, 178.

Barbacenia mantiqueirae Goeth. et Henr. nov. spec. — Caudex brevis, erectus vel adscendens, ad 7 cm longus, 1 cm crassus, squamis fuscis, sulcatis, late membranaceo-marginatis, quarum infimis in fibrillas longas fissis, tectus. Folia spiraliter disposita, remotiuscula; viventia ad 6—8, erecta quorum exteriora saepe apicem versus paullo incurvata; emarcida pauca, patentia usque ad horizontalia, incurvata; omnia rigida, anguste

linearia, acuta, usque ad 38 cm longa, 4—5 mm lata, subcanaliculata, nervo mediano subtus prominente tenuiter rotundato-carinata et margine incrassato, (in sicco) revoluto, pilis longis, paleaceo-deplanatis suberectis, albescentibus, dense vestita; in vaginam amplectentem oblongo-lanceolatam, sulcatam late membranaceo-marginatam dilatata. Pedunculus solitarius subterminalis, validiusculus, trigonus, striatus, superne a medio fere glandulis parvis atris, breviter stipitatis remotiusculis vestitus, foliis brevior, ad 27 cm longus. Perigonii tubus cylindricus, basi longe angustatus, circ. 18 mm longus, duabus partibus ovario (subtrigono?) costis 12 breviter stipitato-glandulosis perducto, adnatus. Tepala erecto-patentia, circ. 25 mm longa; 3 exteriora oblongo-lanceolata, acuminata, circ. 8 mm lata, parallelinervia; 3 interiora ovato-oblonga, circ. 11 mm lata, apice obtusa, oblique-nervosa. Filamenta oblonga, membranacea, binervia, 10 mm longa, 3 mm lata, apice bifida; laciniis filamento triplo brevioribus, parallelis, acutis, apice anguste rotundatis; ima basi antheras prope basin dorsifixas, filamento subbreviores, gerentia. Stylus filiformis, parte stigmatifera circ. 5 mm longa, vix dilatata, subuliformi, stigmata oblonga, staminum apicem haud attingens. Capsula ignota.

Brasilia: S. Paulo. Herb. Commissao geographica e geologica de S. Paulo no. 3570. leg. A. LÖFGREN „Pico dos Marins. Serra da Mantiqueira 10 janv. 1897".

Observatio: B. purpureae similis, sed diversa: foliis margine revoluta, vix serratis cum carina paleaceo-pilosa, filamentis acute laciniatis, fabrica styli.

Imag. photogr.: Herb. Lugd. Bat. no. 179, 180, 181, 182.

Barbacenia mollis GOETH. et HENR. nov. spec. — Caudex brevissimus. Folia interiora erecta et erecto-patentia; exteriora reflexa plana vel (juniora) canaliculata, linearia, acuta usque ad 12 cm longa, 12 mm lata, vix carinata, utrinque pilis tenuibus longiusculis hyalinis, in glandulas parvas oblongas terminatis densiuscule vestita. Scapus solitarius, foliis brevior, subtrigonus, striatus, pilis tenuibus, breviusculis, in sicco rubescentibus densiuscule obsitus. Perigonii tubus cylindricus, ad 27 mm longus, 4—5 mm latus, $^1/_3$ parte ovario oblongo quam tubus crassiore adnatus, pilis brevibus, patentibus, glanduliferis, apicem versus rarioribus, densiuscule obsitus. Tepala exteriora ignota; interiora erecto-patentia, obovata, lanceolata, obtusa, breviter mucronulata. Filamenta quadrangula, ad 4 mm longa, 1 mm lata, incisione paullum profunda, late triangulari, laciniis brevissimis, acutiusculis; in bifurcatione antheram fere basifixam, ad 9 mm longam gerentia. Stylus filiformis, parte stigmaitfera modice

incrassata, ellipsoidea, inter stamina et tepala intermedius. Descriptio e specimine unico imperfecto.

Brasilia: prov. Minas Geraes. A. de St. Hilaire no. C. 962 (Herb. Mus. Paris).

Barbacenia oxytepala Goeth. et Henr. nov. spec. — Caudex erectus, circ. 14 cm longus, 2 cm crassus, squamis fibroso-fissis, fusco-griseis subadpressis dense tectus, foliis vetustioribus numerosis reflexis velatus. Folia remotiuscula, spiraliter disposita, numerosa, primum erecta usque ad horizontalia; marescentia reflexa; omnia anguste linearia, cuspidata, striata, nervo mediano subtus paullum prominente tenuiter carinata, margine subincrassata carinaque remote subadpresse denticulata, circ. 19 cm longa, 0.5 cm lata. Flores rubri, ad 2 per rosulam. Scapi validiusculi, trigoni, sulcato-striati, glabri, foliis breviores. Perigonii tubus elongatus, cylindricus, ad 5 cm longus, 4 mm crassus, partibus $^{2}/_{5}$ ovario subtrigono, cylindrico subcrassiore adnatus, obscure costatus, in costis pilis raris subuliformibus praeditus, fauce abrupte paullum ampliatus. Tepala erecta, dimidio tubo longiora, linearia acuta, parallelinervia; 3 exteriora extus brevissime subpilosa. Stamina tres partes tepalorum longa, erecta. Filamenta subcoriacea dimidiato-oblonga, apicem versus attenuata leviter emarginata laciniis brevissimis acutis, circ. 10 mm longa, 4 mm lata, antheram haud procul a basi dorsifixam circ. 15 mm longam, paullum infra apicem gerentia. Stylus filiformis inter stamina et tepala intermedius, parte stigmatifera oblongo-ovoidea, paullum incrassata. Cetera ignota.

Brasilia: prov. Minas Geraes ubi in rupibus humidis raro occurrit. Schwacke no. 8353. „Birybiry bei Diamantina, auf feuchten Felsen, Selten! März 1892"., Typus in Herb. Berol.

Imag. photogr.: Herb. Lugd. Bat. no. 183.

Barbacenia polyantha Goeth. et Henr. nov. spec. — Caudex brevissimus. Folia numerosissima, usque ad 40, subrosulata, exteriora pleraque horizontalia vel plus minusve reflexa, interiora erecta, omnia linearia, superne angustata plus minusve contracta, breviuscule cuspidata, plana, striatula, nervo mediano subtus paullum prominente anguste rotundato-carinata, margine integra breviter, basin versus longiuscule ciliata, vaginis arcte adpressis resina propria conglutinatis, 10—13 cm longa, 5—7 mm lata. Scapi numerosi, usque ad 12 per rosulam, erecti, subflexuosi, filiformes, trigoni, sulcati, pilis in parte basali scapi albidis, brevibus, subadpressis, apicem versus gradatim in glandulis nigrescentibus, brevius-

cule tenuiter stipitatis transeuntibus obsiti. Flores parvi, erecti vel subinclinati, violacei. Perigonii tubus breviter cylindricus, basi angustatus, circ. 13 mm longus, 6 mm amplus fere ½ parte ovario adnatus, pilis glanduliferis breviusculis et glandulis tenuiter, breviuscule stipitatis, densiuscule vestitus. Tepala erecta e basi paullum angustata, apice late rotundato-subinflexo, circ. 4—5 mm longa; exteriora toto dorso, interiora secus nervum medianum glandulis majoribus breviter stipitatis dense vestita. Stamina tepalis paullo breviora. Filamenta e basi dilatata fere quadrata, 2—2½ mm longa profunde bifida, laciniis oblongis cuspidatis, prope bifurcationem antheram basin filamenti paullum, apicem longe superantem gerentia. Stylus crassiusculus, parte stigmatifera paullum incrassata, elongato-oblongo, apicem antherarum haud attingens.

Brasilia: prov. Minas Geraes. GLAZIOU no. 19931 „Pinheiro, près de Birybiry, entre les rochers 26 Mai 1892. Fleurs violacées. Typus in H. L. B. sub no. 912.180—579.

Imago photogr.: Herb. Lugd. Bat. no. 113.

Barbacenia Riedeliana GOETH. et HENR. nov. spec. — Caudex brevissimus squamis griseis adpressis tectus. Folia ad 10, subrosulata, erecta et erecto-patentia; exteriora pauca horizontalia; nonnulla emarcida reflexa; omnia anguste linearia, leviter curvata, longe cuspidata, tenera, striatula, glabra, integra, basin versus anguste scarioso-marginata, circ. 15 cm longa, 4 mm lata. Flores lutei, solitarii. Scapus foliis vix longior, trigonus, inferne glaber, a medio fere pilis crassis brevibus patentibus in glandulas atras abeuntibus, apicem versus numerosioribus et paulum longioribus obsitus. Ovarium oblongum, acute trigonum, 12-costulatum; costae serie glandularum breviter stipitatarum remotiuscularum praeditae; inter costis brevissime sparse glandulosum, circ. 11 mm longum 3 mm crassum. Perigonii tubus cujus circ. $^1/_7$ pars ovario adnatus, circ. 75 mm longus, costulatus, supra ovarium angustatus, circ. $1^1/_2$ mm amplus, ubique parce glanduloso-pilosus, deinde faucem versus ampliatus, infundibuliformis, fere glaber, fauce 8 mm amplus. Tepala erecta linearia, circ. 20 mm longa, $3^1/_2$ mm lata, obtusa, mucronulata, parallelinervia, glabra. Stamina tepalis fere duplo breviora. Filamenta e basi lata angustata, filiformia circ. $6^1/_2$ mm longa, bifida laciniis fere parallelis, angustis, acutis fere $^1/_3$ parte filamenti longis, prope incisionem antheram gerentia, cujus basis basin filamenti haud attingit, cujus apex apicem filamenti 3 mm superat. Stylus filiformis, parte stigmatifera oblongo-cylindrica, stamina paullum superans.

Brasilia: prov. Minas Geraes in Serra da Lapa. RIEDEL no. 1058

(ex Herb. Fischer) „Barb. acaulis fl. lut. in fissur. rup. S. d. Lapa, nov. 1824". Typus in H. L. B. sub no. 937.95—1.

Imago photogr.: Herb. Lugd. Bat. no. 130.

Barbacenia Schwackei Goeth. et Henr. nov. spec. — Caudex ignotus. Folia ad 6 erecta, conferta, subcurvata, plana et canaliculato-complicata, acuta, striata, pilis deplanatis, albidis, anguste lanceolato-linearibus, breviusculis, subtus hirsuta, supra parce adpresseque pilosa, in carina paullum prominente et in margine haud manifeste ciliata. Flores ad 1—2 in apice caudicis, lutei. Scapus foliis brevior, trigonus, pilis longiusculis, subuliformibus, tortuosis, patentibus et erecto-patentibus, fulvis, dense vestitus. Perigonii tubus cylindricus, ad 20 mm longus, 8—9 mm crassus, ½ parte ovario adnatus, totus pilis ut in scapo occurrent, apicem versus decrescentibus, vestitus. Tepala erecta, tubo plus quam triplo breviora, fere rectangularia, apice late rotundata, mucronulata, circ. 6 mm longa, 4—5 mm lata; 3 exteriora in toto dorso breviuscule pilosa; 3 interiora tantum in parte mediana dorsi. Filamenta plana, hyalina late linearia, usque a medio fere bifida, laciniis lanceolatis acutissimis, paullum divergentibus, tota margine glandulis parvis breviter stipitatis, hyalinis, remotiusculis praedita; nervo mediano, infra laciniis bifurcato perducta, antheram medium laciniarum attingentem basin filamenti circ. 3 mm excedentem prope basin gerentia. Stylus tepalorum basin haud attingens, parte stigmatifera paullum incrassata, conica.

Brasilia: prov. Minas Geraes; Schwacke no. 8357. „Bl. gelb. Minas Geraes. Serra de Cipó 25 avril 1892. Typus in Herb. Berol.

Imago photogr.: Herb. Lugd. Bat. no. 125.

Barbacenia Sellovii Goeth. et Henr. nov. spec. — Caudex brevissimus, incrassatus, squamis griseis, plus minusve fissis apice curvato-reflexis, resina propria conglutinatis tectus. Folia rosulata; vegeta usque ad 8, erecta, vetustiora horizontalia et emarcescentia reflexa; omnia linearia, cuspidata, plana, striata, glabra, nervo mediano subtus paullum prominente anguste carinata, margine longe densiuscule, carina brevius ciliata, 9—16 cm longa, 4—7 mm lata. Flores ad 1—4 per rosulam, pseudoterminales, sulfurei. Scapi foliis paullo longiores, trigoni, prope basin glabri, inferne pilis brevibus, subadpressis, albidis, gradatim in pilis longioribus patentibus, atris, glanduliferis et apicem versus in glandulis stipitatis ovarii transeuntibus, vestiti. Ovarium oblongum, trigonum, dense stipitato-glandulosum. Perigonii tubus usque ad 25 mm longus circ. ½ parte ovario adnatus, supra ovarium paullum constrictus,

deinde campanulato- vel infundibuliformi-ampliatus, fauce circ. 12 mm amplus, in parte libera glandulis breviter stipitatis et pilis glanduliferis inferne densiusculis, faucem versus multo rarioribus praeditus. Tepala primum erecto-patentia, dein horizontalia recurvata, plus quam dimidium tubum longa, circ. 15 mm longa, 7 mm lata, oblonga, obtusa, mucronulata, parallelinervia; 3 exteriora paullum longiora, dorso breviter glanduloso-pilosa; 3 interiora secus nervum medianum tantum extus glandulifera. Filamenta late linearia, usque a medio fere bifida, laciniis anguste triangularibus vel lanceolatis, saepe plus minusve inaequalibus, circ. 5 mm longa, $1\frac{1}{2}$ mm lata, prope bifurcationem antheram basin et apicem filamenti multo excedentem gerentia. Stylus filiformis trigonus, parte stigmatifera modice incrassata, oblongo-lineari, apicem antherarum haud attingente. Capsula immatura fere globosa.

Brasilia: prov. Minas Geraes. SELLO no. C. 311. Serra da Mooda ann. 1818. Typus in H. L. B. sub no. 937.95—5; WARMING 1084 in rupestribus subalpinis; Serra da Piedade. LHOTZKY, MARTIUS.

Barbacenia Seubertiana GOETH. et HENR. nov. spec. — Caudex brevis usque ad 7 cm longus, 1 cm crassus, simplex vel furcatus, erectus vel adscendens, squamis laceratis, fuscis, subadpressis tectus. Folia spiraliter disposita, conferta vel fere subrosulata; interiora circ. 8—10 erecta et erecto-patentia; sequentia plura horizontalia usque ad reflexo-patentia; emarcida diu persistentia reflexo-patentia vel reflexa; omnia saepius plus minusve curvata, subcanaliculata usque ad complicata, lineari-lanceolata vel linearia, acuminata, striata, nervo mediano subtus prominente tenuiter carinata, margine carinaque serrulato-aculeolata, 7 usque ad 20 cm longa, 7—9 mm lata. Flores rubri, solitarii vel (rarius) bini, subterminales. Scapus foliis subbrevior, validus, subtrigonus, costatus, superne aculeolis brevibus, acutis, erecto-patentibus, apicem versus numerosioribus, scaber. Perigonii tubus 15—22 mm longus basin versus gradatim attenuatus, prope basin aculeolis, ut in scapo occurent, scaber, tribus partibus ovario trigono, 12-costato adnatus; costae aculeolis acutis erecto-patentibus, quarum tres in aciebus ovarii magis prominentes et aculeolis majoribus praeditae in tepala exteriora continuantur. Tepala erecta, tubo fere aequilonga; 3 exteriora lanceolata, obtiuscula, mucronato-acuminata parallelinervia, nervo mediano extus minute aculeolato, circ. 5 mm lata; 3 interiora paullum latiora, obtiuscula, haud mucronata, glabra, margine angusta oblique nervosa. Filamenta circ. 8 mm longa, 3 mm lata, membranacea, binervia; nervis superne saepius furcatis; apice bifida, laciniis parallelis, fere quadratis, saepe emargi-

natis; ima basi antheras subbreviores fere basifixas gerentia. Stylus trigonus, medium staminum vix superans, in dimidia parte superiore vix incrassata, conica, apice rotundata, stigmatifera. Capsula ignota.

A B. *purpurea* diversa, foliis subrosulatis brevioribus, saepe curvatis aculeolis marginalibus approximatis; scapo tuboque perigonii aculeolis parvis acutis, nec glandulis obtusis obsito, glandulis styli deficientibus, flore rubra nec violaceo-purpurea. Huc pertinet B *purpurea* Hook.f. var. *minor* Seubert, in Fl. Bras. III. 1. p. 68.

Brasilia: Rio Janeiro; Glaziou no. 17824. Haut de la chaine dos Orgaos, sur les rochers, le 6 mars 1888, Fleurs rouges. Typus in H. L. B. sub no. 912.180—470; Glaziou no. 17296. „Serra dos Orgaos, à Faboinha sur les rochers, le 6 mars 1888. Fleurs rouges (H. L. B. sub no. 912. 180—574; id. Glaziou no. 16387; Morro da Gavea au sommet entre les rochers, 30 oct. 1865. Fleurs rouges. Glaziou no. 3625; id Pedra acu. Serra dos Orgaos à 2230 m alt., 22 oct. 1872. Fleurs rouges. Glaziou no. 6453; Gardner 5897! Herb. Delessert, Herb. Berol.; Glaziou 4261! Herb. Berol.

Imag. photogr.: Herb. Lugd. Bat. no. 146a, 156.

Barbacenia stenophylla Goeth. et Henr. nov. spec. — Caudex 14 cm longus, 2—3 mm crassus, simplex (an semper?), teretiusculus, elongatus, erectus vel adscendens et prope basin radicans; vaginis foliorum arcte adpressis, sulcatis, tenuiter carinatis, fulvis, tectus; fere totus foliis emarcidis, persistentibus, saepissime reflexis, velatus. Folia trifaria, superposita ad 7 mm distantia; juniora nonnulla erecta; cetera, ad 5—10, erecto-patentia et patentia; emarcida numerosa, diu persistentia; omnia anguste linearia, subcanaliculata, longe cuspidata, circ. 8 cm longa, 2 mm lata, nervo mediano subtus prominente, rotundato, carinata, margine carinaque denticulis acutis, densiusculis, subadpressis serrata, dein glabrescentibus. Flores subterminales, solitarii, rubri, folia longe superantes. Scapus 10—12 cm longus, filiformis, subtrigonus, sulcato-striatus, flexuosus, glandulis breviter stipitatis, apicem versus numerosioribus obsitus. Perigonii tubus circ. 8 mm longus, tribus partibus ovario ellipsoideo adnatus, parte libera infra faucem ampliata; urceolato-ovata, costis circ. 12, rariuscule verrucoso-glandulosis perductus. Tepala tubo duplo longiora, circ. 18 mm longa, erecto-patentia, subaequilonga; exteriora angustiora, 2½—3 mm lata, lanceolata, acuta, basi angustata, subunguiculata, parallelinervia, extus brevissime sparseque glanduloso-punctata; interiora circ. 5 mm lata, oblongo-lanceolata, obtusiuscula, mucronulata, oblique venosa, extus in parte basali serie mediana glandularum brevissimarum

notata. Stamina circ. quattuor partes tepalorum longa. Filamenta circ. 13 mm longa, membranacea, quasi unguiculata, profunde bifida, laciniis latis, divergentibus, obtiusculis, interdum emarginatis perducta; nervo mediano crasso, haud procul ab incisione abrupte truncato et ibi antheram circ. 5 mm longam, apicem filamenti excedentem, prope basin dorsifixam gerente; laciniae venis duabus perductae, quarum una ex apice nervi mediani oriunda apicem laciniae attingit, altera parallela, interdum furcata, in dimidia fere altitudine nervi nascitur. Stylus filiformis, tepala aequans vel parum superans, in parte superiore vix incrassata cylindrica, 4 mm longa, stigmatifera. Capsula ignota.

Brasilia: Goyaz. GLAZIOU no. 22220a: „Morro do Salto entre les rochers, le 15 janvier 1895. Fleurs rouges".

Imago photogr.: Herb. Lugd. Bat. no. 154.

Barbacenia trigona GOETH. et HENR. nov. spec. — Caudex (brevis?), incrassatus, foliis emarcidis numerosis reflexis velatus. Folia numerosa (ad 12) primum erecta, dein erecto-patentia et curvato-patentia, emarcescentia reflexa, juniora complicata, vetustiora plana; omnia late linearia cuspidato-acuminata, circ. 20 cm longa, 1 cm lata, nervo mediano subtus modice prominente acutiuscule carinata, utrinque pilis subadpressis, longiusculis, deplanatis, angustis, albescentibus in carina saepe sublongioribus, binatis vestiti, margine subincrassata ciliis fuscescentibus breviuscule ciliata. Scapi 3 per rosulam, foliis subaequilongi, validi, erecti, apicem versus flexuosi, obtuse trigoni, sulcati, inferne setis subuliformibus, subadpressis, antrorsum spectantibus, in tertia parte superiore scapi gradatim in setas glanduliferas, deinde in pilos glanduliferos breviores patentes, demum infra ovarium in verrucas transeuntibus. Perigonii tubus fere $^2/_3$ partibus ovario trigono, elongato-oblongo adnatus, fere 20 mm longus, supra ovarium paullum ampliatus, in parte ovariali glandulis majoribus fere sessilibus densissime positis vestitis, in libera parte glandulis verruciformibus paullo majoribus retrorsum spectantibus densiuscule praeditus. Tepala, tubo fere duplo breviora, erecto-patentia e basi lata sensim paullum angustata, apice late rotundata, circ. triplo longiora quam lata; 3 exteriora sublongiora, toto dorso glandulis verruciformibus margines versus decrescentibus et in pilos breves glanduliferos transeuntibus induta; 3 interiora dorso secus nervum medianum serie verrucis minoribus praedita. Stamina tepalis paullo breviora. Filamenta plana, late linearia fere 4-plo longiora quam lata circ. 8 mm longa, apice bifida, incisione triangulari laciniis acutis circ. 2—3 mm longis, antheram circ. 10 mm longam basin filamenti aequantem, haud procul a basi gerentia. Stylus capsulaque ignoti.

Brasilia: prov. Minas Geraes. Descriptio e specimine unico a cl. A. DE ST. HILAIRE lecto. St. Hilaire no. 489 „Milho Verde" (Herb. Paris). Imago photogr.: Herb. Lugd. Bat. no. 117.

Barbacenia viscosissima GOETH. et HENR. nov. spec. — Caudex brevis, simplex. Folia dense conferta, subrosulata; interiora circ. 6—8 erecto-patentia et patentia; exteriora reflexa marcescentia apicibus involutis; omnia lineari-lanceolata usque ad linearia, plana, acutissima, striatula, nervo mediano subtus vix prominente, utrinque dense breviuscule glanduloso-pubescentia, viscosissima, ad 9 cm longa, 9 mm lata. Flores solitarii, subterminales, coccinei. Scapus foliis plus quam duplo brevior, pilis tenuibus, longiusculis, patentibus, glandula parva oblonga terminatis dense vestitus. Perigonii tubus longe campanulato-cylindricus, usque ad $5^1/_2$ cm longus, costatus, circ. in $^1/_6$ parte ovario oblongo adnata, pilis ut in scapo praeditus, dense glanduloso-pilosus, supra ovarium angustatus ad 2 mm amplus, faucem versus pilis glanduliferis, paullatim brevioribus rarioribusque vestitus. Tepala ovario circ. sesquilongiora, oblonga, circ. 15 mm longa, 6 mm lata, parallelinervia; 3 exteriora vix angustiora, acutiuscula, extus breviter glanduloso-pilosa; 3 interiora obtusa, breviter mucronulata, glabra. Stamina tepalis fere duplo breviora. Filamenta rectangularia, apice late triangulari-emarginata, laciniis brevissimis, acutis, ad $2^1/_2$ mm longa, 1 mm lata, prope apicem antheram linearem, fere 9 mm longam, dorsifixam, filamenti basin paullum, apicem fere duabus partibus excedentem, gerentia. Stylus filiformis, parte stigmatifera incrassata, tripartito-globosa, stamina aequans. Cetera ignota.

Brasilia: RIEDEL no. 205 „Barbacenia glutinosa, flor coccineis in rupibus St. Juão" Junio '24. Typus in H. L. B. sub no. 937.95—2. et in Herb. Leningrad.

Imag. photogr.: Herb. Lugd. Bat. no. 121.

Vellozia Alexandrinae (SCHOMBURGK) GOETH. et HENR. nov. comb. = *Barbacenia Alexandrinae* SCHOMBURGK; in SCHOMBURGK, Die Barbacenia Alexandrinae, entdeckt und beschrieben. Tract. Braunschweig 1845. et ex HOOKER Journ. of Bot. IV (1845) p. 13. *V. tubiflora* HUMB. BONPL. et KUNTH in Nov. Gen. et Spec. p. 119 = *Radia* v. *Campderia tubiflora* RICHARD in KUNTH Syn. Pl. I (1822), huc non pertinet. Descriptio non quadrat.

Caudex 3—4 m altus, dichotomus. Rami crassi, diametro circ. 30—40 mm, rotundato-trigoni. Tunicae valde auctae, arcte adpressae, dense

imbricatim dispositae, apice late convexae, emarginatae, juniores apice breviter extus revolutae, mox breviter fissae, dorso remote acuteque costatae, piloso-tomentosae. Folia circ. 30—50 cm longa, 12—15 mm lata, linearia, in apicem fere filiformen sensim angustata, integerrima, obsolete carinata, marginibus in sicco revolutis, undique pube brevi, subtus longiore, sericea, fasciculato-sublepidota, obtecta, pilis marginalibus longioribus, praesertim versus basin folii. Flores speciosi, albi, extus rubescentes plurimi per rosulam. Pedunculi 7—12.5 cm longi (sec. SCHOMBURGK), basi laeves. Ovarium inferum, oblongum, obtuso-trigonum, tubo perigonii paullo latius, densissime tuberculis glandulosis praeditum. Tepala in tubum circ. 7 cm longum, cylindricum hirtum, supra ovarium tuberculis glandulosis, sparsis connata. Laciniae circ. 5 cm longae, medio 7 mm latae, acuminatae, basi angustatae, exteriores dorso scabro-punctatae, marginibus latiuscule-laevibus, interiores paullo latiores, fere omnio laeves; omnes aequilongae. Stamina 18, in phalanges 6 disposita, laciniis perigonii opposita. Filamenta in tubo profunde adnato-decurrentia, prope basin laciniarum breviter libera. Antherae lineares circ. 15 mm longae. Stylus perigonio paullo brevior. Stigma trilobo-peltatum. Capsulae non vidi, secundum SCHOMBURGK triloculares, apice truncatae. Semina numerosa, cuneato-trigona, apice truncata.

Guiana Anglica, in montibus Roraima, 1000—1400 m. s. m. SCHOMBURGK no. 1569. Specimina vidi e Mus. Bot. Berol.; Herb. Leningrad; Herb. Delessert.

Imago photogr.: Herb. Lugd. Bat. no. 95.

Vellozia ambigua GOETH. et HENR. nov. spec. — Caudex erectus, ad 1 m altus, usque ad 2½ cm crassus, apice divisus, tunicis adpressis elongato-rectangularibus in spiris 3 abrupte ascendentibus ordinatis tectus. Tunicae fusco-flavae, nitidae, superne griseae, dorso sulcatae, apice late truncatae mox in fibris griseis solutae. Folia in vertice ramorum spiraliter disposita, subrosulata, numerosa (circ. 15) erecto-patentia, lineari-triangularia (circ. 7 mm lata, 12 cm longa) linea recta transverse secedentia, faciebus subtiliter sulcata, nervo mediano tenui margineque spinuloso-serrata, apice rotundata, vaginis dorso glutinosis. Flores speciosi, solitarii, pseudo-terminales; pedunculus validus trigonus, stramineus, sulcatus, superne glandulis breve stipitatis stramineis obsitus, folia aequans v. multo brevior. Ovarium clavato- vel oblongo-trigonum, vertice coarctatum ad basin stipitato-glandulosum, nitente flavo-fuscum, angulis saepissime acutis, circ. 6—7 mm latum, 2—3 cm longum. Tepala ovalia apice late rotundata, coerulea. Stamina 30, in phalanges 6, basi squa-

mulis laceris fultas, ordinata, tepalis plus quam 2-plo breviora; antherae filamentis longiores. Stylus trigonus stamina paullo superans. Capsulae ovario similes.

Brasilia meridion.: Sello (in Hb. Berol.); Hb. Warming 1075. leg. Warming in monte Serra do Piedade frequens (sub nom. V. compacta det. Seubert); Schwacke 9040. Minas Geraes. Itacoluma haud rara Hb. Berol.; Weddell. Minas Geraes (Hb. Paris); Clausen id. (Hb. Paris).

Adnotatio: species *V. compactae* valde cognata; differt: dimensionibus minoribus omnium partium, staminibus 30. Ob. flores saepissime defecti multa specimina tamen vix distinguenda sunt.

Vellozia angustifolia Goeth. et Henr. nov. spec. — Suffrutex parvus. Caudex incrassatus, foliis reflexis arcte adpressis tectus, cetera ignota. Folia rosulata, anguste lanceolato-linearia, ad 18 cm longa, 3 mm lata, apice anguste rotundata, subtus sulcata, carina acutiuscula margineque apicem versus remotiuscule serrato-aculeolata; interiora circ. 6 erecto-patentia, apicem versus bicarinata, prope basin subcomplicata, resinosa, exteriora numerosa, reflexa, plana, marcescentia. Flores emarcidi tantum vidi pseudoterminales, ad 2 per rosulam, folia aequantes, pallide violacei. Pedunculi filiformes, sulcati, superne glanduloso-verrucosi, viscosi. Ovarium oblongo-clavatum, triquetrum, ima basi in angulis glanduloso-verrucosum, apice coarctatum, fusco-lutescens, nitens. Tepala patentia vel patentissima, lanceolata, acuta, circ. 25 mm longa. Stamina linearia, circ. 15 mm longa, filamentis brevibus. Stylus filiformis, stamina superans. Stigma late trilobo-peltatum. Capsula matura ignota.

Brasilia: Morro Cubatao entre les pierres (Goyaz) 11 avril 1895 Plante naine. Fl. bleu pale. leg. Glaziou no. 22213. Typus in H. L. B. sub. no. 912.180—535.

Vellozia annulata Goeth. et Henr. nov. spec. — Arbuscula parva. Caudex erectus, brevis, furcatus, trigono-rotundatus, 9 mm diametiens. Tunicae amplectantes, in series fere verticales ordinatae, arcte adpressae; eae caudicis apice late rotundatae, emarginatae, inter se 5 mm distantes, dorso fusco-cinereae, sulcatae, inter sulcis squamulis brevibus, subadpressis, distantibus praeditae; eae ramorum foliiferum formae similes, sed apice emarginato rudimentis duobus brevibus revolutis folii delapsi praeditae, (quae rudimenta annulorum ad instar caudicem circumcludent), dorso pilis albidis, longiusculis, subadpressis cinereae. Folia in apice ramorum ad 12 conferta, erecto-patentia, subcanaliculata, rigida, linearia, in apicem angustam sed rotundatam sensim angustata, ad 10 cm longa,

8 mm lata, margine subrevoluta haud serrata, ad basin pilis longis cinereis instructa, carina filiformis rotundata, supra glabra, subtus sulcata et squamulis griseis apice in pilos solutis in series plus minusve evidenter obliquas ordinates dispositis. Flores per rosulam solitarii, albi. Pedunculus longtudine foliorum, trigonus, superne glandulis breviter stipitatis asper. Ovarium oblongum, 6 mm longum, 4 mm diametiens, dense glandulosum. Perigonii tubus cylindricus, 60 mm longus, 1½ mm diametiens, glandulosus. Perigonii limbus infundibuliformis, laciniis ovato-lanceolatis, acutis, acuminatis, 40 mm longis, 6 mm latis. Stamina ad 18 in fauce tubi oriunda, filamentis in tubum longe decurrentibus, partibus liberis brevibus. Antherae filiformes, ad 7 mm longae, quam filamenta multo longiores. Stylus filiformis, stamina superans, in perigonio inclusus. Stigma trilobo-peltatum. Capsulae ignotae.

Brasilia: leg. GLAZIOU, Cachoeira da Vargem Grande, entre les rochers. 4 janv. 1895. no. 22212.; Serra dos Veiadadoes (Goyaz) entre les rochers. 6 janv. 1895. no. 22217. Typus in H. L. B. sub no. 912. 180—540.

Imago photogr.: H. L. B. no. 93.

Vellozia barbata GOETH. et HENR. nov .spec. — Suffrutex erectus, plus quam 40 cm altus, circ. trifurcatus. Rami erecti, teres, circ. 5 mm crassi, tunicis arcte adpressis, ovalibus, apice late truncatis, sulcatis, atris, margine setis circ. 5 mm longis, horizontalibus, purpurascentibus, serius glabris, tecti; vertice subrosulato foliati. Folia numerosa (ad 10), subulato-linearia (1½ mm lat., 6 cm long.), superne triquetra, sicca complicata, dorso obsolete carinata, striata, margine setis patentibus albo-purpurascentibus, inferne ad 5 mm longis apicem versus gradatim se minuentibus, brevissime acuminata, apice anguste rotundata. Flores ignoti. Capsulae pedunculatae, pseudo-terminales, folia aequantes. Pedunculus crassiusculus teretiusculus, sulcatus, glandulis stipitatis obsitus. Capsula globosa glandulis stipitatis densiuscule obsita, rudimentis triangularibus tepalorum coronata.

Brasilia: Diamantina, dans le Campo pierreux de Minas, 11 avril 1892. Arbuste, fleurs blanches. GLAZIOU 19942. Typus in H. L. B. sub no. 912.180—547.

Adnotatio. Habitus et characteres plurimi subgeneris *Xerophytae*, sed quia rudimenta 12 vel 18 staminum videre censui, in hac sectione posita.

Imago photogr.: H. L. B. no. 54.

Vellozia cana Goeth. et Henr. nov. spec. — Caudex brevissimus, simplex vel furcatus, incrassatus. Tunicae valde auctae, tenues, apice late rotundatae, dorso costis validis, remotiusculis applanatis percursae, castaneae; pilis longis, fasciculatis, subadpressis, dense albo-tomentosae praeditae. Folia ad 7 rosulata, 20—35 cm longa, circ. 10 mm lata, linearia, a medio fere in acumen longum, filiforme sensim angustata; margine revoluta, haud serrata; subtus sulcata, supra excavato-punctata, utrinque paleis liguliformibus, apicem versus in pilos singulos, plus minusve numerosis dissolutis, patentissimis vel reflexis, praesertim in facie inferiore et basin versus canescentia. Flores ad 1—2 per rosulam foliorum, albi? vel coerulei? Pedunculus foliis circ. duplo brevior, trigonus, sulcatus, in parte superiore glandulis parvis, breviter stipitatis, nigris praeditus. Ovarium rotundato-trigonum, ovatum, ad 7 mm longum, 3 mm diametiens, glandulis breviter stipitatis, peltatis, aequilongis, confertis indutum. Perigonii tubus cylindricus, ad 6.5 cm longus, 2½ mm diametiens, glandulosus. Perigonii limbus infundibuliformis, laciniis lanceolatis, exterioribus angustioribus, acutiusculis, subacuminatis, extus in parte mediana glandulosis, ad 7 cm longis, usque ad 12 mm latis. Stamina 18, in fauce tubi inserta, filamentis brevibus (circ. 3 mm longis) tubo adnatis longe decurrentibus. Antherae linearis, ad 8 mm longae. Stylus validiusculus, trigonus, stamina longe excedens. Stigma late trilobo-peltatum. Capsulae ignotae.

Brasilia: (prov. Goyaz) leg. Glaziou no. 22219. Paranana entre les rochers, 12 févr. 1895. Typus in H. L. B. sub no. 912.180—521.

Imago photogr.: Herb. Lugd. Bat. no. 92.

Vellozia circinans Goeth. et Henr. nov. spec. — Suffrutex mediocris (prob. usque ad 60 cm altus). Caudex erectus, indivisus v. furcatus, brevis (circ. 10—25 cm altus), circ. 2—2½ cm crassus, dense fibroso-tunicatus. Tunicae ovales fuscae, in parte superiore fibroso-laceratae, fibris validis circinatis praeditae, dorso rotundatae, pseudo-plicatae costis remotis. Folia in apice caudicis ad 6 fere rosulata, erecta, paullo curvata, linearia, cuspidata, sub-canaliculata, acutiuscule carinata, margine, carinaque densiuscule adpresse serrato-spinulosa, usque ad 40 cm longa, 6 mm lata, irregulariter secedentia. Flores speciosi, campanulati, pseudoterminales, solitarii, foliis breviores; pedunculus erectus, infra apicem sub-curvatus, validiusculus, trigonus, sulcatus, glaber, saepissime lutescens, interdum dilute atro-violaceus, usque ad 20 cm longus; ovarium clavato-cylindricum, truncatum, dense paleaceum; paleae sordide luteae, subadpressae, lineares v. lanceolatae; tepala lanceolata, acuta, v. rotun-

dato-apiculata, circ. 7—9 cm longa, 12 mm lata, pallide coerulea; stamina erecta, (24 numeravi), linearia dimidiis tepalis subbreviora, filamentis quam antheris brevioribus. Stylus validiusculus, apice curvatus, stamina superans. Stigma late trilobo-peltatum. Capsula ignota.

Brasilia: Serra de São João dt. El Rei, entre les rochers (Minas) 24 oct. 1887. Plante prèsqu'acaule. Fl. bleues. GLAZIOU no. 17291. Typus in H. L. B. sub no. 912.180—530; Pico da Sander aut Pico du Suspiro sine floribus, 11 août 1881. GLAZIOU no. 13268 in H. L. B. sub no. 912. 180—528; CLAUSSEN 27 (no. 20) in campis siccis Cachoeira do campo sine flore (Hb. Delessert, Hb. Paris); LANGSDORFF, Serra da Lapa (ex herb. Fischer no. 1052 Leningrad); RIEDEL; LANGSDORFF 2830 (herb. Leningrad).

Vellozia crassirama GOETH. et HENR. nov. spec. — Suffrutex mediocris, ramis (e descriptione Glaziovii) crassis. Caudex tunicaeque non visi. Folia rosulata, ad 10, late triangulari-linearia, 30 cm longa, 15 mm lata, sordide griseo-viridia, breviuscule acuminata, plana, apicem versus sub-bicarinata, subtus evidenter sulcata, margine carinaque dense serrulata, supra valde aspera, interiora, erecta vel erecto-patentia, breviora, exteriora patentissima. Flores ad 3—8 per rosulam, speciosi, coerulei. Pedunculi filiformes, triquetri, foliis plus quam triplo breviores, glabri. Ovarium oblongo-clavatum, apice truncatum, triquetrum, vernicosum. Tepala oblonga vel oblongo-lanceolata, obtusiuscula vel obtusa, breve mucronulata, circ. 5 cm longa, erecto-patentia. Stamina numerosa, linearia, tepalis plus quam 2-plo breviora, filamentis brevibus. Stylus filiformis, staminibus $1/4$ parte longior. Stigma late trilobo-peltatum. Capsula ignota.

Brasilia: Rio Forto dans le campo au Retiro (Goyaz) 12 fév. 1895. Arbuste, fl. bleues. GLAZIOU no. 22210. Typus in H. L. B. sub no. 912. 180—538.

Vellozia crinita GOETH. et HENR. nov. spec. — Suffrutex humilis. Caudex brevissimus, incrassatus, ovoideus, dense adpresseque tunicatus. Tunicae valde auctae, late ovales, apice rotundato in fibros curvatos fissae, atro-fuscae, sulcatae. Folia subrosulata, ad 6 per rosulam, erecto-patentia, exteriora marcescentia reflexa; omnia curvata, canaliculata vel subcomplicata, linearia a medio fere sensim attenuata, anguste carinata, utrinque sulcata, margine carinaque densiuscule adpresse serrata; serraturis in pilos longos, albidos, apicem folii versus gradatim breviores, abeuntibus; apice angustissime rotundata, 20 cm longa, 5 mm lata.

Flores pseudoterminales, solitarii, pedunculati, mediocres, lilacini. Pedunculi filiformes, trigoni, inferne glabri, a medio fere muricibus brevibus, anguste linearibus, applanatis, apice acutis, plus minusve tortuosis, quorum basales minuti, superiores gradatim longiores sunt, obsiti. Ovarium obovatum, apice truncatum, paleis, iis pedunculi similibus, sed multo longioribus, usque ad 4 mm longis, dense praeditum. Tepala oblonga vel obovata, circ. 35—50 mm longa, 10—15 mm lata, apice obtusa, mucronulata. Stamina circ. 15, tepalis 2½-plo breviora. Antherae lineares, filamentis filiformibus 3-plo longiores. Stylus staminibus circ. 1½-plo longior. Stigma late trilobo-peltatum. Capsula ignota.

Brasilia: Sommet de la Serra de São José d'El Rey, sur les rochers. 15 déc. 1886. Fleurs lilas. Glaziou no. 16388. Typus in H. L. B. sub no. 912.180—543.

Vellozia declinans Goeth. et Henr. nov. spec. — Caudex dichotomoramosus, ca. 25 cm altus, 0.5 cm crassus, vaginis griseo-fuscis arcte adpressis, spiraliter dispositis obtectus. Folia summa in parte ramorum conferta, erecta, acerosa, glauca, subcanaliculata, linearia, superne paullo angustata apice rotundata obliqua emarginata, margine carinaque aculeolato-serrulata. Vaginae quam folia latiores apice late truncato, superiores margine serrata, mox laeves, dorso rotundatae, valleculis angustissimis costisque satis latis subcanaliculatis percursae. Flores quasi terminales, pedunculo quam foliis brevioribus. Tepala lineari-lanceolata apiculata coerulea erecto-patentia 2 cm longa; stamina 18 tepala aequantia, antheris linearibus flavis quam filamentis longioribus. Stylus filiformis stigmate peltato, stamina superans. Germen obconicum elongatum obtuse trigonum aequaliter minute verrucosum. Capsulae laterales obconicae trigonae vel ± rotundatae tenuiter verruculosae, fuscae, stylo basibusque triangularibus acutis tepalorum coronatae, declinatae.

Brasilia: Langsdorff 1655 e. p. In saxosis Serra d. Lapa Nov. 1824 (Herb. Leningrad). Typus in H. L. B. sub no. 937.47—320.

Imago photogr.: Herb. Lugd. Bat. no. 44.

Vellozia echinata Goeth. et Henr. nov. spec. — Suffrutex habitu ignoti. Rami ad 2 cm crassi, dense adpresse tunicati; tunicae auctae, brunneae dorso valide costatae, costis fere quadratis, superne in fibris validis solutae, fibri in tunicis summis circinati. Folia ad 6 in apice ramorum sub-rosulata, erecto-patentia sordide viridia, linearia longiuscule cuspidata, canaliculata, margine subrevoluta, acute carinata, margine carinaque spinulosa-serrata, circ. 20 cm longa, 6 mm lata. Flores ignoti.

Capsulae folia aequantes pseudo-terminales et laterales, solitariae; pedunculus erectus, apice curvatus, validus, trigonus, sulcatus, inferne glaber a medio pedunculo glandulis breve stipitatis obsitus, primo brevissimis remotisque, deinde apicem versus gradatim longioribus et densius positis et in muricibus capsulae abrupte transeuntibus. Capsula oblonga, straminea, basibus tepalorum persistentibus, lanceolatis, erectis, coronata, dense echinata, muricibus flavescentibus, e basibus incrassatis confluentibus, subulatis, glanduliferis, erecto-patentibus, basalibus reflexis, ad 2 mm longis, multo minoribus intermixtis.

Brasilia: Caraça entre les pierres (Minas), 18 fév. 1884 (GLAZIOU na. 15504. Petit buisson, fl. blanche. Vulg. Capim cheiroso. Typus in H. L. B. sub no. 912.180—542; SELLO 1328 (Hb. Leningrad, Brux. Berol.); A. ST. HILAIRE (sine numero) Hb. Paris.

Imag. photogr.: Herb. Lugd. Bat. no. 19, 20, 21.

Vellozia exilis GOETH. et HENR. nov. spec. — Suffrutex erectus, parvus circ. 30 cm altus. Caudex erectus, tenuis (circ. 2 mm crassus) teres, prope basin jam parce dichotome ramosus, tunicis lineari-lanceolatis, arcte adpressis griseo-fuscis integerrimis valde remotis tectus. Rami caudice similes, erecti, apicem versus folia pauca patentia gerentes. Tunicae lineari-lanceolatae, anguste sulcatae brunneae, apicem versus cinerascentes, mox griseo-fuscae, dorso rotundatae, haud carinatae, apice late truncatae, margine fibris nonnullis ramo amplectentibus emittentes. Folia: vaginae adpressae, laminae patentes, lineares, breve acuminatae, involutae, sulcatae, margine nervi mediani serratae, aculeolatae, apice rotundatae, nervo mediano utrinque late alato, partes laterales involutae; folia ad 10 cm longa. Flores ignoti, breve pedunculati. Capsulae ovales, pseudoterminales, obsolete trigonae, 1 cm longae, 6 mm crassae, muricibus triangulari-linearibus, acutis, longiusculis, subadpressis, fuscescentibus, luteis, dense obsitae, pedunculi teretes, sulcati muricis tenuibus, rectis, breviusculis, paullo reflexis, densiuscule induti.

Brasilia: GLAZIOU 22220 — Chapadâo dos Viadeira (Goyaz) 9 janv. 1890. Fleurs blanches. Typus in H. L. B. sub no. 912.180—539.

Imag. photogr.: Herb. Lugd. Bat. no. 33.

Vellozia fibrosa GOETH. et HENR. nov. spec. — Frutex caudice crassiusculo (± 2 cm) vaginis arcte adpressis griseis apice in fibris solidis curvatis solutis, tectus. Folia in apice ramorum ad 10, rosulata, glauca, plana, erecta prope apicem bicarinata, lineari-triangularia, apice obtusa emarginata, margine carinaque in summa parte spinuloso-scabra cetera

laevia. Flores 3—4 per rosulam. Tepala lanceolata, acuta, coerulea, erecto-patentia, ad 3 cm longa. Stamina numerosa tepalis dimidio breviora, antheris linearibus (flavis?). Stylus antheras multo superans crassiusculus. Stigma peltatum. Germen obconicum triquetrum nitens, lutescens, in basi angulorum interdum scabriusculum. Scapi triangulares in summa parte nonnumquam scabriusculi. Capsula obconica triquetra lutescens nitens, infra tepalorum rudimenta et interdum in ima basi angulorum scabriuscula.

Brasilia: GLAZIOU 19936! Biribiry au Mocoto près de Diamantina dans le campo (Minas) 30 mars 1892. Arbuste de fl. bleues. Vulg. Casella d'Ema. Typus in H. L. B. sub no. 912.180—531.

Imag. photogr.: Herb. Lugd. Bat. no. 50.

Vellozia fimbriata GOETH. et HENR. nov. spec. — Suffrutex probabiliter robustus. Caudex ramique ignoti. Tunicae superiores (quae tantum adsunt) valde auctae, ovales, apice late truncatae, breviuscule fibrosae, sublignosae, margine late scariosae, fuscae, nitentes, plicatae, dorso planae. Folia in summitates ramorum ad 7 sub-rosulata secedentia, plana, subcanaliculata, linearia, longe et tenuissime acuminata, circ. 40 cm longa, 1 cm lata, margine pilis albidis, superne breviusculis adpressis, basin versus gradatim longioribus minus adpressis, in parte basali circ. 5 mm longis, erecto-patentibus, dense obsitis; supra glabra, juniora glutinosa, subtus carinata, breviuscule densissime crispo-tomentosa. Flores ad 3 per rosulam, subspeciosi, pseudo-terminales; pedunculus gracilis ad 30 cm longus, trigonus, sulcatus, inferne glaber, superne minute glanduloso-asper, glandulis brevissimis, inferne sparsis, apicem versus densius dispositis; ovarium oblongum glandulis brevissimis dense obsitum, apice planum sub-5-gonum cinereo-flavum; tepala erecto-patentia, coerulea, lanceolata; tria exteriora parum latiora et paullo longiora, anguste acuminata, apice subinflexa, circ. 5.5 cm longa, 1 cm lata, tria interiora obtusa, fere 8 mm lata; stamina ad 15 in fasciculos 6, basi attenuata tepalorum adnata, $^{1}/_{3}$ longitudinem tepalorum aequantia, filamentis quam antheris multo brevioribus. Stylus filiformis, staminibus multo longior, apice curvato. Stigma late trilobo-peltatum. Capsula ignota.

Brasilia: leg. LANGSDORFF, in Serra da Lapa; unicum e herb. Fischer (Leningrad).

Vellozia Gardneri GOETH. et HENR. nov. spec. — Omnibus characteribus *V. glauca* simillima, differt tamen notis sequentibus. Folia marginata, valleculis fere deficientibus, subtus inter nervos saepissime costis

tenuibus stomatiferis percursa. Flores ad 3 per rosulam. Ovarium muricibus lineari-subulatis, apice indiviso vel breviter bicuspidato. Tepala lineari-lanceolata. Stamina dimidia tepala superantia.

Brasilia: Prov. Goyaz. Gardner no. 4018. Typus in Hb. Vindob. etiam in Hb. Paris. Berol. et Delessert.

Vellozia glandulifera Goeth. et Henr. nov. spec. — Suffrutex humilis. Caudex brevis, parum incrassatus, circ. 7 cm longus, 12 mm crassus, dense imbricatim tunicatus. Tunicae valde auctae, oblongae, margine scariosae, apice truncato breviter recurvato, dorso rotundatae sulcatae, atro-fuscae. Folia in apice caudicis ad 10 subrosulata, exteriora patentissima, sequentia gradatim minus patentia, interiora erecta, omnia secedentia, linearia, apicem versus sensim attenuata, obtusa, apice latiuscula, margine integra, revoluta, dorso carinata, subtus breviter densissime griseo-villosa, supra glabra, circ. 12 cm longa, 5 mm lata. Flores mediocres, pseudoterminales, solitarii, violacei, folia superantes. Pedunculi filiformes, erecti vel leviter curvati, trigoni, sulcati, inferne glabri, ceterum glanduloso-pilosi; pili crebri, inferiores brevissimi, apicem versus gradatim longiores, graciles, rufescentes, in pilos ovarii abrupte transeuntes. Ovarium ovatum, pilis longis, rufescentibus, gracilibus, glanduliferis, dense obsitum. Tepala obovato-oblonga, obtusa erecta. Stamina circ. 15, linearia, tepalis duplo breviora. Filamenta antheris circ. 4-plo breviora. Stylus filiformis, tepalis quarta parte brevior. Stigma trilobo-peltatum. Capsula ignota.

Brasilia: De Langsdorff, in arenosis graminosis pr. Cachoeira. Herb. Fischer 1418. Typus in H. L. B. sub no. 937.47—321.

Vellozia Glaziovii Goeth. et Henr. nov. spec. — Caudex humilis ad 12 cm altus, fusiformis ad $2\frac{1}{2}$ cm crassus, saepe divisus, dense adpresse tunicatus, superne folia pauca (ad 5) subrosulata gerens. Tunicae late ovatae, apice truncatae, fuscae, v. cinnamomeae, vestustiores valde auctae, nitentes, v. parenchymate evanescenti, e nervis validis longitudinalibus remotis transverse reticulatim connexis compositae. Folia secedentia, linearia, longe acuminata, apice angustissime rotundata, erecta v. erecto-patentia, subtus sulcata plana v. (sicca) saepe complicata; carina tenui rotundata, margine haud incrassata, in parte superiore carinae remote adpresse aculeolata, ad 30 cm longa. Flores speciosi, coerulei, pseudoterminales, solitarii, pedunculati; pedunculus acute trigonus, sulcatus, inferne glaber, apicem versus muricibus gradatim longioribus et numerosioribus, in illis ovarii transeuntibus, asper, ad 6 cm longus. Ovarium

breve subtrigono-cylindricum, basi rotundatum, apice truncatum dense muricatum muricibus subadpressis, subtortuosis, subulatis, stramineis. Tepala lanceolata, acuta, erecta, circ. 7 cm longa, 1½ cm lata. Stamina ad 15, linearia, filamentis quam antheris multo brevioribus, tepalis 2-plo breviora, in fasciculos per 2, 3 v. 4 connata. Stylus trigonus validiusculus, stamina superans. Stigma trilobo-peltatum. Capsulae ignotae.

Brasilia: Glaziou 22214. Serra dos Veadeiros. près du Ponso dans le campo (Goyaz) 6 janv. 1895. Plante naine, fleurs bleues. Typus in H. L. B. sub no. 912.180—523; id. no. 931.107—45.

Imag. photogr.: Herb. Lugd. Bat. no. 32.

Vellozia granulata Goeth. et Henr. nov. spec. — Suffrutex parvus. Caudex digitalis, brevis, erectus?, squamis in fibris apice circinnatis solutis tectus. Folia ad 6 in apice caudicis rosulata, linearia erecto-patentia, curvata, rigida, obsolete tricarinata, complicata tota margine et superne in parte carinarum, spinuloso-serrata, subtus obsolete valleculata, vaginis elongatis, linea transversali arcuata articulatis, ad 7 mm lata, 17 cm longa. Squamae juniores truncatae, emarginatae, striatae mox in fibris numerosis, apice circinnatis solutis. Flores pseudo-terminales, solitarii, pedunculo triquetro, sulcato, punctulis elevatis scabriusculo. Tepala oblongo-lanceolata, acuminata, ca. 10 mm longa. Stamina tepalis breviora, numerosa, antheris linearibus flavis, quam filamentis longioribus. Stylus filiformis triqueter, stamina superans, stigma peltatum, trilobum. Germen trigonum oblongo-clavatum, apice constrictum, punctulis minutis hyalinis granulatum. Capsula erecta, oblonga, apice oblique truncata, dentibus obscuris, basi rotundata, brunneo-lutescens, minute granulata.

Brasilia: Diamantina, au Curalinho, dans le campo (Meinos) 14 avril 1892. Glaziou no. 19934! Typus in H. L. B. sub no. 912.180—544; Schwacke 8361. Biribing pr. Diamantina Mart. '92.

Imag. photogr.: Herb. Lugd. Bat. no. 42.

Vellozia grisea Goeth. et Henr. nov. spec. — Frutex parvus usque ad 40 cm altus. Caudex adscendens v. erectus circ. 30 cm altus, 1½ cm crassus, inferne teretiusculus superne obtuse trigonus, indivisus v. parce furcatus, tunicis arcte adpressis remotiusculis, griseis, in parte basilari caudicis in fibris fuscis solutis, tectus, in summitate subrosulato-foliatus. Tunicae sublignosae ovatae, apice late truncatae, cinerascentes, inferne fuscae, dorso obtusissime carinatae, costatae; costae proximae, lateraliter appendicibus ad tunicam adpressis, deplanato-spinuliformibus notatae, appendices fere totam valleculam obtegent. Folia secedentia ad 5 per

rosulam erecto-patentia v. patentia, dimensionibus valde variis, 8 usque ad 28 cm longa, 3 usque ad 10 mm lata, plana, linearia, longiuscule angustata, tenuiter rotundato-carinata, margine carinaque spinuloso-serrata, apice anguste rotundata v. obtusa, in dorso sulcato, paleis adpressis, vertice fimbriato-pilosis induta. Flores pseudoterminales, 1—2 per rosulam, breviuscule pedunculati (in specimina omnia valde deteriorata) probabiliter speciosi; pedunculus circ. 5 cm longus, 1 mm latus, trigonus, striatus haud incrassatus, muricibus tenuibus breviusculis, subadpressis notatus; ovarium ovale, rotundato-trigonum, muricibus patentibus in parte basilari incrassatis, apicem versus attenuatis, partim bicuspidatis, subtortuosis partim glochidiatis, densissime obsitum; tepala lineari-lanceolata ad 7 cm longa, in specimina herbariorum omnia valde deteriorata. Stamina circ. 18, linearia antheris quam filamentis longioribus, dimidiis tepalis fere arquilonga. Stylus validus, trigonus, stamina superans. Stigma late trilobo-peltatum. Capsula ignota.

Brasilia: WEDDELL, inter Goyaz et Cujaba (Herb. Paris).

Imag. photogr.: Herb. Lugd. Bat. no. 23.

Vellozia hirsuta GOETH. et HENR. nov. spec. — Suffrutex parvus. Folia in summa parte ramorum conferta, ad 25 cm longa, circ. 8 mm lata, linearia, a medio fere sensim in acumen filiformem angustata, subtus sulcata, carina lata, rotundata percursa, margine revoluta; praesertim in facie inferiore et basin versus pilis applanatis, longis, patentibus, albidis hirsuta; in facie superiore breviuscule adpresse pilosa. Flores ignoti. Species valde peculiaris, pilis lanceolatis gilvescentibus, nitentibus, insignis.

Brasilia: leg. GLAZIOU no. 19924; Birybiry près de Diamantina dans le Campo (Minas) 24 mars 1892. Plante naine, sans fleurs. Typus in H. L. B. sub no. 912.180—558.

Imag. photogr.: Herb. Lugd. Bat. no. 96.

Vellozia leptopetala GOETH. et HENR. nov. spec. — Suffrutex erectus, parvus ± 20 cm altus. Caudex indivisus vel dichotomus ad 4 cm crassus, vaginis truncatis sulcatis, fuscis nitentibus apice albescentibus, arcte adpressis, tectus. Folia summa in parte caudicis spiraliter ordinata numerosa, erecta, glauca, linearia, longitudine et latitudine variae, 3.5 usque ad 11 cm longa 0.2 cm lata, apicem versus sensim angustata, subtricarinata, margine et superne in parte carinarum aculeolato-serrata, apice truncata, obliqua, emarginata, linea transversa cum vagina articulata, striata. Flores quasi terminales saepissime solitarii folia superantes,

mediocres, scapus florigerus usque ad 7 cm longus, profunde sulcatus, pilis brevibus patentibus apice inflatis (an glanduliferis?) asper. Germen ovatum sub orificio constrictum pilis (ut in scapo) asperum. Tepala lineari-spathulata, reflexa pallide-coerulea. Stamina 18, erecta, antheris linearibus flavis filamentis paullo brevioribus. Stylus filamentis longe superans apice incrassatus. Stigma peltatum. Capsulae maturae laterales, deinde sub folia insertae, griseo-fuscae, opacae vel nitentes, verruculosae, asperae, oblongae sub orificio paullo constrictae, basibus triangularibus acutis apice recurvatis tepalorum et stylo persistente coronatae. Scapus fructiferus profunde sulcatus, nigrescens, demum patens.

Brasilia: Minas Geraes. Gardner 5230!; Langsdorff, S. da Lapa! Typus in H. L. B. sub no. 937.47—365; Birybiry bei Diamantina auf Felsen. Schwacke 8352!, 8354! (fructifera!); Rio Janeiro, Glaziou 13266! (fructifera); Minas Geraes, St. Hilaire!

Imag. photogr.: Herb. Lugd. Bat. no. 26, 27.

Vellozia leucanthos Goeth. et Henr. nov. spec. — Suffrutex humilis. Caudex brevis, furcatus. Rami erecti, saepe numerosi, dense conferti, ut caudex adpresse tunicati. Tunicae fusco-griseae, opacae, dorso costis remotis, applanatis percursae, mox in fibris validiusculis, paullo curvatis fissae. Folia in apice ramorum subrosulata, omnia vel exteriora tantum patentissima vel reflexa, juniora patentia et erecto-patentia, (folia floralia erecta), curvata, resinosa, canaliculata, linearia, ad 13 cm longa, 4 mm lata, acuta, apice angustissime rotundata, margine incrassata; subtus sulcata, pilis albis longiusculis, subadpressis praedita, serius glabrescentia, carina rotundata; supra glabra. Flores in apice ramorum solitarii, pedunculati, albi, in speciminibus a me visis omnes valde deteriorati. Pedunculus validiusculus, trigonus, sulcatus, in parte superiore glandulis, parvis, breviter stipitatis, sparsis praeditus, usque ad 80 mm longus. Ovarium oblongum, muricibus breviusculis, teretibus, apice glanduliferis, patentibus densissime obsitum. Perigonii tubus cylindricus, plus quam 50 mm longus, glandulis breviter stipitatis, sparsis asper. Cetera ignota.

Brasilia: Glaziou no. 15674. Serra do Ificionado près de Caraça, dans le Campo. (Minas) 10 juli 1883. Typus in H. L. B. sub no. 937.79—82.

Imag. photogr.: Herb. Lugd. Bat. no. 88.

Vellozia maculata Goeth. et Henr. nov. spec. — Arbuscula parva (ramosa?). Caudex non vidi. Rami teretiusculi, ad 10 mm crassi, tunicis

arcte adpressis imbricatim tecti. Tunicae inter se ad 4 mm distantes, apice late truncatae, paullo emarginatae, in junioribus rudimenta dua revoluta folii delapsi gerentia, dorso atro-fuscae, subnitentes, remotiuscule costatae. Folia haud rosulata, in summa parte ramorum conferta, numerosa, anguste-linearia, circ. 20 cm longa, 7 mm lata, a medio fere sensim in acumen longum, tenuissimum angustata, canaliculata; margine (sicca) revoluta, obsolete distanter serrulata, in serraturis squamulis adpressis, parvis, acutis praedita, ima basi laminae pilis nonnullis longiusculis ciliata; supra laevia, subtus sulcata, carinata, in parte vaginantia maculam fusco-atram, apice cordatam praebentia; carina rotundata, dorso squamulis parvis, subadpressis, lanceolatis, acutis, binis vel ternis, densiuscule regulariter dispositis praedita. Flores terminales, solitarii, folia superantes, albi. Pedunculus in tertia parte superiore grandulis stipitatis, parvis asper. Ovarium rotundato-trigonum. oblongum, densissime breviter glandulosum, 10 mm longum, 5 mm latum. Perigonii tubus tenuis, cylindricus, 7 cm longus, 1½ mm crassus, dense glandulosus. Perigonii limbus infundibuliformis, circ. 5 cm amplus, segmentis ovato-lanceolatis, 6 cm longis, 15 mm latis, acutis, breviter mucronatis. Stamina 18, in tubi faucis inserta; filamenta brevissima, in tubum longe adnato-decurrentia; antherae lineares, ad 2 cm longae. Stylus validiusculus, trigonus, stamina longe superans, in perigonio inclusus. Stigma late peltatum trilobum. Capsulae ignotae.

Brasilia: leg. GLAZIOU no. 22218a Cachoeiras da Vargem Grande de la Serra da Balisa. 5 janv. 1895. (Herb. Paris).

Imag. photogr.: Herb. Lugd. Bat. no. 87, 90.

Vellozia Martiana GOETH. et HENR. nov. spec. — Suffrutex robustior, circ. 6—9 dm altus, dichotome ramosus. Rami crassi circ. 2 cm diam.; vaginae in series tres obliquas dispositi, cinerascentes, rectangulares, fissae, mox laceratae et in fibris solutae; partes liberae paullulo divergentes, apice leviter incurvatae. Folia numerosa fere rosulata, sicca saepissime complicata, erecta triangulari-linearia, apice angustissime rotundata, saepissime haud emarginata, margine et in parte superiore carinae serrulata, prope basin linea transversa secedentia. Flores pseudoterminales folia subaequantes vel superantes, scapo crassiusculo, triquetro, sulcato, superne setis brevibus glanduliferis scabro. Germen ita ut capsula obovatum, truncatum, trigonum, basi praesertim ad angulos, interdum tota superficie setis glanduliferis brevissimis vel glandulis verruculosis, scabrum, griseo-fuscum, opacum, vel nitente-lutescens. Tepala erecto-patentia, lanceolata?, obtusa?, ± 4 cm longa, coerulea. Stamina

30?, in phalanges sex basi squamulis laceris fultas ordinata, tepalis duplo breviora, antherae filamentis longiores.

Brasilia: Martius, Herb. Flor. Bras. no. 725 (sub nom. V. verruculosa et V. compacta); Riedel no. 112 (Hb. Delessert) (Hb. Paris); Claussen Pico do Itabira do Campo (Hb. Delessert); Glaziou 17290. Serra do Itabira.

Ad *V. compactam* et *V. ambiguam* maxime accedit; differt a *V. compacta* staminibus 30, a *V. ambigua* tunicis laceris apice incurvatis.

Vellozia pilosa Goeth. et Henr. nov. spec. — Suffrutex parva, caespitosa. Caudex brevis, pluriceps, squamis in fibris solutis griseo-lutescentibus tectus; rami erecti. Folia membranacea, erecto-patentia, numerosa, exteriora patentia, subulato-linearia, haud carinata, apice acutiuscula, tota superficie pilis albidis erecto-patentibus sparsis e tuberculo multicellulari oriundis induta, viscosa, minute striata usque ad 1.5 mm lata 40 mm longa, vetusta contorta, vagina striata, parce pilosa. Squamae mox calvescentes, laceratae, in fibris solutae, griseo-lutescentes. Scapi 1—2 per rosulam foliorum, laterali ± arcuati, rufescentes, sulcati, filiformes, setis glanduliferis breviusculis brunneis obsiti, foliis paullo breviores. Flos parvus in scapo erectus. Tepala albida patentia. Stamina plura (18?), antheris linearibus filamentis brevibus. Stylus stigmaque non vidi. Germen ellipsoideum apice cylindraceum lutescens, nitens, setis glanduliferis sparsis obsitum. Capsula ut germen, apice dentes sex breves oblique truncati, erecti, gerens.

Brasilia: Dimantina, sur les rochers (Minas) 16 avril 1892. Fleur blanchâtre. leg. Glaziou no. 19933. Typus in H. L. B. sub no. 912. 180—546.

Imag. photogr.: Herb. Lugd. Bat. no. 16.

Vellozia pleurocarpa Goeth. et Henr. nov. spec. — Suffrutex parvus, circ. 14 cm altus, erectus, ramosissimus. Caudex brevis, saepissime a basi jam ramosus. Rami erecto-patentes, furcati, subarcuati, fere aequilongi, in summa parte tantum dense foliosi. Squamae arcte adpressae, fuscae, sulcatae, ovato-lanceolate, margine apicem versus aculeolatae, apice truncatae. Folia linearia, erecta (humefacta tamen erecto-patentia), pungentia; vaginis fuscis, ovato-lanceolatis, sulcatis, margine apicem versus aculeolis nonnullis gerentibus; laminis (siccis) involutis, sulcatis, linea transversali secedentibus, margine remote aculeolatis, apice rotundatis. Flores pseudo-terminales, parvi, breviter pedunculati, folia aequantes, erecti, germine globoso-trigono, glandulis breve stipitatis obsito; tepalis lineari-

lanceolatis, acutis, dilute coeruleis, reflexis (an semper?); staminibus filiformibus, tepala fere aequantibus, stylo filiformi, elongato, stigmate parvo, trilobo, peltato. Capsulae laterales, longe persistentes, erecto-patentes, mox horizontales ,trigono-globosae v. subovatae, fusco-stramineae, obsolete 12-costatae, sparse glanduloso-asperae, pedunculo curvato, quam capsula circ. 2-plo longiore.

Brasilia: Biribiry, près Diamantina, dans le campo (Minas) 25 mars 1892. Fleur bleue pâle. GLAZIOU no. 19941. Typus in H. L. B. sub no. 912.180—526; SCHWACKE no. 8345! 8346! (Hb. Berol.).

Imag. photogr.: Herb. Lugd. Bat. no. 7, 10.

Vellozia pumila GOETH. et HENR. nov. spec. — Caudex brevis, fere ovalis, circ. 4 cm atlus, 1½ cm crassus, indivisus, dense adpresse tunicatus. Tunicae ovales, valde auctae, scariosae, nitente fuscae, costatae, costae in tunicis vetustioribus fibris numerosis ascendentibus connexae, serius in fibris solutae, apice truncatae, fibroso-fissae, fibris apice saepius curvatis. Folia secedentia? plana v. sicca subcomplicata, patentia v. erecto-patentia, brevius acuminata, dorso sulcata, nervo medio tenui, rotundato, carinata, margine incrassata carinaque densiuscule aculeolata, aculeolis erecto-patentibus, apice angusta, obtusa. Flores subspeciosi. coerulei, pseudoterminales, solitarii, pedunculati; pedunculus foliis multo brevior, circ. 1½—2½ cm longus, tenuis, trigonus, sulcatus, inferne glaber, superne pilis brevibus patentibus scaber. Ovarium breve subtrigono-cylindricum, basi rotundatum, apice truncatum, dense muricatum, muricibus subadpressis, subulatis, subtortuosis, stramineis. Tepala lanceolata acuta, erecta, circ. 4 cm longa. Stamina ad 15, irregulariter fasciculata, tepalis circ. 2-plo breviora filamentis quam antheris multo brevioribus. Stylus trigonus, validiusculus, stamina superans. Stigma trilobo-peltatum.

Brasilia: GLAZIOU 22215, Ponte Alta près de la cascade dans les camops. 28 sept. 1894. Typus in H. L. B. sub no. 912.180—522. id. sub no. 931.107—55. Maxime accedit ad *V. Glaziovii*, diversa praesertim statura minore, foliis saepissime patentibus, marginatis, brevius acuminatis, densius serratis, pedunculis brevioribus minus muricatis, floribus minoribus.

Imag. photogr.: Herb. Lugd. Bat. no. 28.

Vellozia rhynchocarpa GOETH. et HENR. nov. spec. — Rami crassi circ. 3 cm diametientes, rotundato-trigoni, furcati, apicem versus attenu-

ati. Tunicae fuscae, valde auctae, dense imbricatim dispositae, marginibus tenuibus arcte adpressae, ita ut fines tunicarum invisibiles, apice late rotundatae, in tunicis nonnullis breviter recurvatae, dorso costis remotis, validiusculis, rotundatis et sulcis angustissimis alternantibus percursae, glabrae. Folia ad 7—10, rosulata, circ. 44 cm longa, 8 mm lata, linearia, a medio sensim in acumen fere filiformi angustata, sicca margine subrevoluta, remote breviuscule spinulosa, carina filiformi, supra laevia, subtus sulcata denseque subadpresse fasciculatim villosa, serius glabrescentia. Flores ignoti. Capsulae pedunculatae, ad 1—3 per rosulam Pedunculus ad 9 cm longus, validus, subtrigonus, inferne glaber, a medio fere glandulis breviter stipitatis apicem versus densissime positis, verrucosus. Capsulae oblongae, tricoccae, ut pedunculus glandulis stipitatis verrucosae, 22 mm longae, 13 mm crassae, apice rostro longo, subulato verrucoso (tubus perigonii induratus?) instructae.

Brasilia: Prov. S. Paulo inter Canna Verde et Cajuru ad Matto grosso in campo sicco petroso. leg. Regnell. Feb. 1849 no. III 1241. Mus. Bot. Holm.

Imag. photogr.: Herb. Lugd. Bat. no. 94.

Vellozia Riedeliana Goeth. et Henr. nov. spec. — Suffrutex, secundum adnotationes Riedeli 15—33 cm altus. Caudex ramique ignoti. Tunicae (superiores tantum adsunt) ovales; dorso crebre costatae, fuscae, nitentes, fissae, apice breviter recurvatae. Folia ad 5 rosulata; ad 25 cm longa, 4 mm lata, resinosa, linearia, in acumen fere filiformi gradatim angustata, sicca margine revoluta, incrassata, distanter serrato-setosa; carina anguste filiformi; subtus sulcata, subadpresse pilosa, pilis longiusculis sub lente subulatis, subramosis; supra fere glabra. Flores per rosulam solitarii, breviter pedunculati, albi. Pedunculis trigonus, striatus, ad 2 cm longus, glandulis breviter stipitatis asper. Ovarium fusiforme, 11 mm longum, 3 mm diametiens, muricibus (glanduliferis?), erectopatentibus, quam ii pedunculi multo longioribus, densissime vestitum. Perigonii tubus ad 6.5 cm longus, glandulis breviter stipitatis dense obsitus; pars inferior angusta (ad 1 mm crassa), cylindrica, abrupte in partem superiorem, fere duplo crassiorem, subbreviorem, cylindricam abiens. Perigonii limbus tubuloso-infundibuliformis, segmentis lanceolatis, 5.5 mm longis, 1 cm latis (exterioribus tamen multo angustioribus), acutis, breviter acuminatis, extus in parte mediana glandulosis. Stamina 18, circiter in medio tubo inserta; filamentis tenuissimis, ad 2.5 cm longis; antheris linearibus, subaequilongis. Stylus filiformis, trigonus, inclusus, stamina superans. Stigma peltato-trilobum. Capsulae ignotae.

Brasilia: leg. RIEDEL in saxosis Serra da Lapa. Nov. 1824 no. 1051 Herb. Leningrad.

Imag. photogr.: Herb. Lugd. Bat. no. 86, 91.

Vellozia scoparia GOETH. et HENR. nov. spec. — Suffrutex parvus, erectus, v. adscendens basi radicante. Caudex brevis, tenuis, teretiusculus, saepissime jam a basi ramosus. Rami elongati, graciles, teretiusculi, simplices v. furcati, in parte superiore tantum densiuscule foliati, squamis arcte adpressis, fere rectangularibus, apice truncatis, sulcatis, brunneis, apice anguste albo-marginatis tecti. Folia erecto-patentia, vaginis brunneis, superne albescentibus, ovato-lanceolatis, margine integris; laminis linea transversa secedentibus, subulatis, sub-complicatis, (siccis) pungentibus, apice rotundatis v. truncatis, margine integris, valde glutinosis. Flores pseudo-terminales, erecti, peduculati, folia aequantes, coerulei, pedunculo tenui, sub-trigono striato, glandulifero (circ. 1 cm longo), germine globoso-trigono, glandulis breve stipitatis, dense obsito, tepalis lanceolatis, acutis, erecto-patentibus, serius reflexis, ad 8 mm longis; staminibus dimidium tepalorum paullo superantibus, antheris linearibus filamentis filiformibus sublongioribus, stylo erecto, filiformi apice leviter curvato, stigmate trilobo, peltato. Capsulae terminales, serius laterales, erectae v. erecto-patentes, globoso- v. oblongo-trigonae, apice coarctatae stramineae, verrucoso-scabrae, pedunculis circ. 3-plo longioribus, filiformibus, sulcatis glanduloso-scabris.

Brasilia: In saxosis humidis pr. Parauna et Tejuco. LANGSDORFF in herb. Fischer 1417! In saxosis humidis pr. Cachoeira ibid. 1178!; GLAZIOU 19939! Typus in H. L. B. sub no. 912.180—552.

Imag. photogr.: Herb. Lugd. Bat. no. 39.

Vellozia Seubertiana GOETH. et HENR. nov. spec. — (= *V. glauca* β *cujabensis* SEUB. in Fl. Bras. III. i. p. 79). Maxime accedit ad *V. glaucam,* differt characteribus sequentibus: Statura, caudex, rami, ignoti sed probabiliter *V. glauca* similes. Tunicae ut in *V. glauca* sed costis magis elevatis, appendicibus minus regulariter dispositis, subnitidis ita ut tunicae nitidae sunt. Folia lineari-lanceolata longe et anguste acuminata, marginata, margine serrato-spinulosa, carina acuta remotiuscule aculeolata, subtus sulcata, costis lateraliter parce minute aculeolatis, circ. 30 cm longa, 1½ cm lata. Flores speciosi, pseudoterminales, longe campanulati colore ignota; pedunculus brevis usque ad 7 cm longus, validus, trigonus, sulcatus, dense et breve muricato-asper; ovarium ovale, acutiuscule trigonum, muricibus breviusculis sub-5-gonis, sulcatis glochi-

diatis dense obsitum; tepala lanceolata-linearia (12 cm longa, 12 mm lata), rotundata basin versus attenuata; stamina, stylus et stigma ut in *V. glauca* (fide Seubert). Capsula elliptica rotundato-trigona, muricibus inter se adpressis patentibus, e basi sub-5-gona ovoidea, abrupte attenutis, glochidiatis, fuscis.

Brasilia: Spec. auth. Seubertii: Matto-grosso Lhotzky no. 90 (Hb. Vindob.); Exped. 1ma Regnellian. Phanerog. no. 1738c (in Hb. Stockholm) ad Buriti in Serra da Chapada, in „cerrado'' leg. Malme; Matto-grosso cujabensis leg. Menso et Lhotzky no. 90 (Hb. Berol.).

Vellozia variegata Goeth. et Henr. nov. spec. — Suffrutex, erectus, pluries dichotome ramosus. Rami teretiusculi, vaginis spiraliter imbricatim dispositis, arcte adpressis, trapezoideis, apice truncatis, sulcatis, nitentibus, stramineis, in parte superiore distincte delineatis, albis, tecti; pars libera 1 cm, rami 6 mm crassi. Folia in summa parte ramorum numerosa, erecta, linearia, apicem versus sensim angustata carinata, in parte superiore tricarinata, apice oblique rotundata, emarginata, carina laevi, margine remotiuscule serrata summis carinis lateralibus aculeolato-serratis, circ. 3 mm lata, circ. 9 cm longa, linea transversali cum vagina articulata. Flores pedicellati pseudoterminales, in apice ramorum solitarii pedicello folia aequante v. paullo superante. Pedicellus triqueter pilis brevibus crassis glanduliferis sursum spectantibus asper. Germen ovoideum pilis brevibus glanduliferis nigrescentibus obsitum. Tepala oblonga, acuta, violacea 3 cm longa, erecto-patentia. Stamina probabiliter 15, erecta, antheris linealibus flavis, quam filamentis brevioribus. Stylus filiformis. stamina superans. Stigma peltatum. Capsulae ellipsoideae, triquetrae in lateribus sulco profundo mediano praeditae, fusco-stramineae, apice truncatae, pilis brevibus crassis glanduliferis asperae, tepalorum basibus persistentibus acuminatis coronatae. Pedicelli fructiferi quam folia breviores, crassi triquetri lateribus sulcatis superne pilis crassis brevibus asperi.

Brasilia: Rio de Janeiro. Glaziou no. 12221, Novo Friburgo, a la Pedra do Conego, 23 juin 1880. Petit buisson, fleurs violacées. Typus in H. L. B. sub no. 912.180—556 (fructifera).; Glaziou no. 13266, Morro do Suspiro a Nova Friburgo sur les rochers (Rio Jan.) 4 sept. 1881. Fleurs violacées. H. L. B. sub no. 912.180—553; Felsengehänge der Pedra de Conico bei Nova Friburgo, 1400 m leg. E. Ule no. 4617! Specimina e herb. Dumortier in Herb. Brussel conservata florifera.

Nota. Sterilis v. fructifera habitu *V. gracili* et praesertim *V. leptopetalae* similis, a *V. gracili* tamen diversa pedicellis crassioribus multo

brevioribus, a *V. leptopetala* statura altiora ab duabus vaginis apice zona alba praeditis.

Imag. photogr.: Herb. Lugd. Bat. no. 47 et 141.

Vellozia velutinosa GOETH. et HENR. nov. spec. — Suffrutex parvus. Caudex indivisus, brevis, incrassatus, dense tunicatus. Tunicae valde auctae, confertae, apice latissime horizontaler truncatae; juniores rudimentis brevibus, recurvatis, foliorum delapsorum praeditae; dorso fusco-nigrescentes, breviuscule denseque cinereo-tomentosae, remotiuscule costatae, costis validis, dorso applanatis, squamulas brevissimas, erectas, remotas, gerentibus. Folia ad 7, rosulata, plana, subcanaliculata, linearia, apicem versus a medio sensim in acumen tenuem angustata; 20 cm longa, 8 mm lata; subtus sulcata, paleis erectis, anguste ligulaeformibus, apice in pilis solutis, prope basin sublongioribus quasi velutina, supra laevia, subadpresse densiuscule pilosa; margine tenui dense breviuscule paleaceo-pilosa, haud serrata. Flores solitarii, folia superantes, albi. Pedunculus validiusculus, trigonus, a medio fere glandulis parvis, breviter stipitatis, nigrescentibus, apicem versus confertis indutus; 15 cm longus. Ovarium subtrigonum, ovatum, 7 mm longum, 3 mm crassum, densissime breviter nigro-glandulosum. Perigonii tubus cylindricus, tenuis, ad 45 mm longus, 1½ mm crassus; glandulis breviter, basin tubi versus longius stipitatis dense obsitus. Perigonii limbus infundibuliformis, ad 3 cm longus, 3 cm amplus; laciniis lanceolatis, acutis, apice tenuiter acuminato-angustatis, circ. 4 cm longus, 6 mm latus, in parte mediana extus glandulosis. Stamina (in specimine investigata male conservata) 13, in fauce tubi inserta; filamenta brevissima, in tubum adnato-decurrentia; anthere lineares, circ. 10 mm longae. Stylus perigonii fere longitudine, validiusculus, trigonus. Stigma late trilobo-peltatum. Capsulae ignotae.

Brasilia: leg. GLAZIOU no. 22218 Cabeceira du Rio Sta. Anna, 8 janv. 1895.

Imag. photogr.: Herb. Lugd. Bat. no. 89.

Vellozia virgata GOETH. et HENR. nov. spec. — Suffrutex parvis, erectus, saepe gregarius. Caudex simplex v. saepissime ramis fastigiatis, tenuis, teres. Rami (v. caudices indivisi) teretes, tenues, maxima parte dense foliati, cetera foliorum emortuorum tecti. Folia (sicca) erecta; vaginis adpressis, lanceolatis, haud articulatis, sulcatis, griseo-fuscis, margine distante aculeolatis, laminis haud secedentibus subulatis, pungentibus, involutis, sulcatis, margine spinuloso-serratis, apice truncatis

v. rotundatis. Flores parvi, laterales, erecti, pedunculati; pedunculo tenui, trigono, 6-costato, glandulis stipitatis parvis sparse obsito; germine obconico-trigono, nitido, stramineo in aciebus et in medio lateribus costato, costis remote glanduloso-verrucosis; tepalis lanceolatis, acutis, pallide-coeruleis, staminibus linearibus, filamentis brevibus; stylus tenuis staminibus fere subaequilongus. Capsulae acute trigono-ovatae, stramineae, nitidae seriebus 6 glandularum verrucosarum ut in germine obsitae.

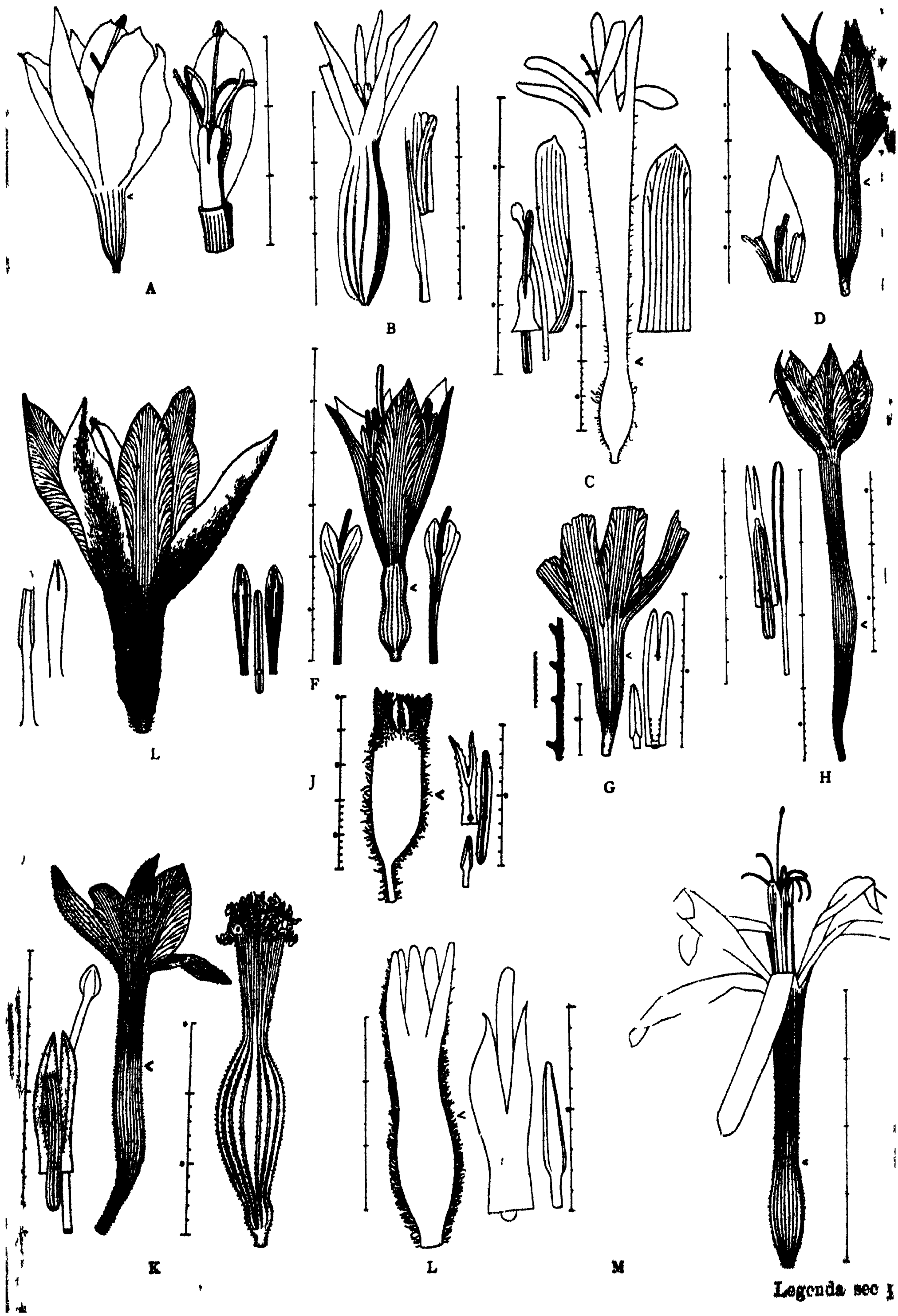
Brasilia: Sao José d'El Rei, dans le campo pierreux (Minas) 20 janv. 1889. Fleur blanchâtre. Glaziou no. 17832. Typus in H. L. B. sub no. 912.180—550; Pico d'Itabira do Campo sur les roches (Minas), 12 sept 1887, sans fleur. Glaziou no. 17292 in H. L. B. sub no. 912.180—549; Weddell 1404!; Pico d'Itabira, Claussen no. 198! (Hb. Mus. Paris).

Imag. photogr.: Herb. Lugd. Bat. no. 5.

Vellozia Wettsteinii Goeth. et Henr. nov. spec. — Suffrutex arbusculiformis, 2- vel 3-ceps. Caudex ignotus. Tunicae juniores oblongae, truncatae, nitenti-lutescentes, arcte adpressae, vetustiores desunt. Folia rosulata, numerosa (ad 30), plurima interiora erecto-patentia, exteriora nonnulla latiora, marcida, patentissima demum reflexa, triangulari-linearia, sulcata, apice angustissime rotundata vel acuta, pungentia, circ. 26 cm longa, usque ad 9 mm lata (exteriora tamen usque ad 15 mm lata). glaucescentia, plana, apicem versus bicarinata, carina angusta, margine subincrassata carinaque superne minute acuteque serrata. Flores speciosi. coerulei, ad 1—3 per rosulam, foliis subbreviores. Pedunculi filiformes. trigoni, fructiferi valde incrassati, glabri. Ovarium oblongum, apice coarctatum, nitens, lutescens, trigonum, glabrum, in angulis interdum verrucis paucis remotis notatum. Tepala obovato-lanceolata, erecta vel erecto-patentia, basi angustata, apice obtusa, sub-mucronulata Stamina in flore singulo a me dissecto ad 25, tepalis fere triplo breviora. Filamenta antheris breviora. Stylus filiformis, trigonus. Stigma late trilobo peltatum. Capsula ignota.

Brasilia: Von Wettstein und Schiffner, Exp. 1901: Estado de São Paulo, zwischen Sacramento und Jaguara am linken Ufer des Rio Grande Typus in Herb. Lugd. Bat. sub no. 937.95—6.

EXPLIC. TAB.; A. *Barb. brachycalyx,* Flos, pet. int. styl., fil. in tub. conn. — B. *B. caricina,* Flos, styl., fil. bif. c. anth. — C. *B. cuspidata,* Flos, pet. ext. styl. fil. anth., pet. int. — D. *B. foliosa,* Flos, pet. int., styl. fil. anth. — E. *B. fulva,* Flos 7/10, styl. fil. anth. — F. *B. stenophylla,* Flos. fil. anth. — G. *B. gaveensis,* Flos, aculeol. tep., fil. anth. — H. *B. glabra,* Flos, styl. fil. anth., pet. ext. — J. *B. Schwackei,* Flos, fil. anth. styl. — K. *B. Goethartii,* Flos, styl. fil. anth., caps. perig. emarc. — L. *B. hirtiflora,* Flos, fil, anth. styl. — M. *B. gentianoides,* Flos.



Legenda sec